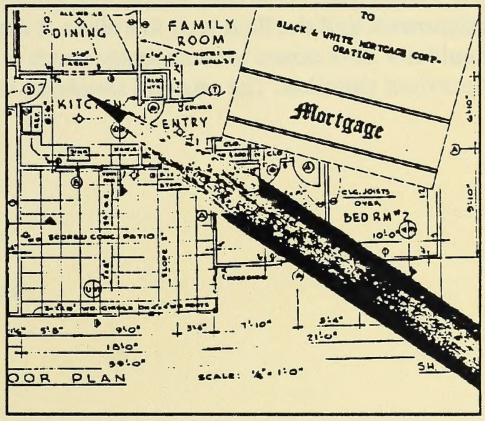
QL.2.1991-448
CANADIANA
University of Alberta Library
0 1620 3409886 1
JUL 25 1991

# MATHEMATICS 33

## Mortgages and Loans




Unit 8

# Learning Facilitator's Manual

Distance Learning

Alberta EDUCATION

## Note

**This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Students should not have access to these assignments or the final tests until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.**

Mathematics 33
Learning Facilitator's Manual
Unit 8
Mortgages and Loans
Alberta Distance Learning Centre
ISBN No. 0-7741-0109-1

Copyright © 1991, the Crown in Right of Alberta, as represented by the Minister of Education. Alberta Education, 11160 Jasper Avenue, Edmonton, Alberta, T5K OL2.

All rights reserved. Additional copies may be obtained from the Learning Resources Distributing Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Education.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this has not been done, please notify Alberta Education so appropriate corrective action can be taken.

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

## Topic 1: Loans

1. Use the appropriate table at the back of the Assignment Booklet to calculate the monthly payment to repay the following loans. Round to the nearest cent.

(2) a. \$15 000 at $10\frac{1}{8}$%/a over twenty-five months

$$\text{Payment} = 44.535 \times \frac{\$15\ 000}{1000}$$
$$= 44.535 \times 15$$
$$= \$668.03$$

(2) b. \$38 500 at $11\frac{1}{2}$%/a over four years

$$\text{Payment} = 26.089 \times \frac{\$38\ 500}{1000}$$
$$= 26.089 \times 38.5$$
$$= \$1004.43$$

(2) c. \$13 700 at $12\frac{3}{8}$%/a over three years

$$\text{Payment} = 33.394 \times \frac{\$13\ 700}{1000}$$
$$= 33.394 \times 13.7$$
$$= \$457.50$$

2. Rachel got a loan of $12 000 to buy a car. The rate of interest quoted was 12% per year compounded monthly. Use the appropriate table at the back of the Assignment Booklet.

(3) a. If the loan is given for a period of five years, what is the monthly payment?

$$\text{Payment} = 22.244 \times \frac{\$12\ 000}{1000}$$
$$= 22.244 \times 12$$
$$= \$266.93$$

(3) b. What is the total amount paid over the five years?

$$\text{Total amount paid} = \$266.93 \times 12 \times 5$$
$$= \$16\ 015.80$$

(3) c. How much interest is paid over the five years?

$$I = \text{total amount} - \text{principal}$$
$$= \$16\ 015.80 - \$12\ 000.00$$
$$= \$4015.80$$

3. Vince Cardinal purchased a boat and arranged for a loan of $30 000 at $12\frac{7}{8}$%/a compounded monthly. Use the appropriate table at the back of the Assignment Booklet.

(3) a. If the loan is paid back over a period of five years, what is the blended monthly payment?

$$\text{Payment} = 22.689 \times \frac{\$30\ 000}{1000}$$
$$= 22.689 \times 30$$
$$= \$680.67$$

(3) b. What is the total amount paid over the five years?

$$\text{Total amount paid} = \$680.67 \times 12 \times 5$$
$$= \$40\ 840.20$$

(3) c. How much is paid in interest over the five years?

$$\text{Interest} = \text{total amount} - \text{principal}$$
$$= \$40\ 840.20 - \$30\ 000.00$$
$$= \$10\ 840.20$$

(2) 4. Which of the following is true when repaying a loan using nonblended payments?

A. Your monthly payment remains the same.

B. Your monthly payment increases each month.

C. Your monthly payment decreases each month.

D. Your monthly payment doubles each month.

The correct answer is C. The monthly payment decreases each month because the principal stays the same but the interest goes down each month.

⑨ 5. Sanjeevan borrows $16 000.00 at 12%/a compounded yearly. At the end of each year she agrees to pay $4000.00 off the principal plus the interest on the outstanding balance. Use $I = Prt$ when calculating the interest for each year.

a. What is the rate per period?

$$\text{Interest rate per period} = \frac{\text{annual rate of interest}}{\text{periods per year}}$$

$$= \frac{12\%}{1}$$

$$= 12\% \text{ or } 0.12$$

b. Construct a repayment schedule.

| Payment Number | Balance Owing | Principal Repaid | Interest Paid | Amount Paid | Balance Outstanding |
|---|---|---|---|---|---|
| 0 | —— | —— | —— | —— | $16 000.00 |
| 1 | **$16 000.00** | **$4000.00** | **$1920.00** | **$5920.00** | **$12 000.00** |
| 2 | **$12 000.00** | **$4000.00** | **$1440.00** | **$5440.00** | **$ 8 000.00** |
| 3 | **$ 8 000.00** | **$4000.00** | **$ 960.00** | **$4960.00** | **$ 4 000.00** |
| 4 | **$ 4 000.00** | **$4000.00** | **$ 480.00** | **$4480.00** | **$ 0.00** |

c. How much would Sanjeevan pay for interest over the period of time?

Sanjeevan would pay $4800.00 in interest on the loan.

d. How long will it take to repay the loan?

It will take Sanjeevan four years to repay the loan.

**Topic 1**

_____ marks

## Topic 2: Mortgages

(4) 1. Explain the difference between a fixed mortgage and an open mortgage.

A fixed mortgage cannot be paid out in part or in whole without a penalty. The interest rate of a fixed mortgage cannot vary within the term. It is good to have a fixed mortgage when interest rates are rising.

An open mortgage can be paid out completely (or in portions) at any time without a penalty. If the mortgage is limited-open, only part of it may be paid out. An open mortgage may or may not have a variable rate of interest.

(10) 2. Use the appropriate table at the back of the Assignment Booklet to find the monthly payments for the following mortgages. Round to the nearest cent.

a. \$40 000 at $12\frac{1}{2}$%/a for ten years

$$\text{Payment} = \frac{\$40\,000}{1000} \times 14.46$$
$$= \$578.40$$

b. \$120 000 at $11\frac{3}{4}$%/a for twenty-five years

$$\text{Payment} = \frac{\$120\,000}{1000} \times 10.14$$
$$= \$1216.80$$

c. \$30 000 at 10%/a for fifteen years

$$\text{Payment} = \frac{\$30\,000}{1000} \times 10.62$$
$$= \$318.60$$

d. \$45 500 at 15%/a for thirty years

$$\text{Payment} = \frac{\$45\,500}{1000} \times 12.29$$
$$= \$559.20$$

e. \$95 300 at $13\frac{1}{4}$%/a for twenty years

$$\text{Payment} = \frac{\$95\ 300}{1000} \times 11.65$$
$$= \$1110.25$$

3. Dallyce Kushniak bought a house and arranged a mortgage of \$60 000 at 18%/a. Use the appropriate table at the back of the Assignment Booklet.

(4) a. If the mortgage has an amortization period of twenty-five years, what is the monthly payment?

$$\text{Payment} = 14.67 \times \frac{\$60\ 000}{1000}$$
$$= 14.67 \times 60$$
$$= \$880.20$$

(4) b. If this interest rate is used for the entire period, what is the total amount paid over the twenty-five years?

$$\text{Total amount} = \$880.20 \times 12 \times 25$$
$$= \$264\ 060$$

(4) c. What is the total amount of interest paid over the twenty-five years?

$$\text{Interest} = \text{total amount} - \text{principal}$$
$$= \$264\ 060 - \$60\ 000$$
$$= \$204\ 060$$

(3) 4. Which of the following is the period of time it would take to pay off a mortgage and all other blended expenses?

A. the term of the mortgage

B. the rate per period

C. the amortization period

D. the present value of the mortgage

The answer is C. The amortization period is the time the mortgagee would take to pay off the loan if everything else remained constant.

(4) 5. List at least four options open to the borrower at the end of the term of a mortgage.

At the end of the term of a mortgage the borrower may opt to

- renegotiate the loan with the existing lender
- refinance the loan with another lending institution
- pay down a lump sum and seek a new term
- pay out the loan and retire the mortgage

(6) 6. List at least four factors that determine the amount of the monthly payment of a mortgage.

The amount of the monthly payment of a mortgage is determined by the following:

- the amount of the mortgage (principal)
- the rate of interest
- the frequency of payments
- the amortization period
- the length of the term
- the type of institution

7. Use the appropriate table at the back of the Assignment Booklet.

(3) a. Find the monthly payment on a mortgage of $55 000 which is amortized over fifteen years at 15% per year.

From the table the monthly payment for $1000 at 15% over a period of fifteen years is $13.70. Since you have $55 000 instead of $1000, the monthly payment would be $55 \times \$13.70$ or $753.50 for fifteen years.

(4) b. How much of this money was spent on interest over the fifteen years?

The amount spent on interest over the life of the mortgage would be the total amount paid minus the principal.

$$\begin{aligned}\text{Interest payments} &= \$753.50 \times 12 \times 15 - \$55\ 000 \\ &= \$135\ 630 - \$55\ 000 \\ &= \$80\ 630\end{aligned}$$

Therefore, the amount spent on interest is $80 630.

(6) 8. List at least three steps that a person can take to reduce the amount paid in interest on a mortgage.

In order to reduce the interest on a mortgage over the life of the mortgage, a person could

- obtain a mortgage at a lower rate of interest
- make a larger down payment at the outset and apply for a smaller mortgage
- choose a shorter amortization period so that most of the instalment dollar will go toward reducing the principal
- choose a short term when the interest rate is high and a long term when it is low

(6) 9. Use the appropriate table at the back of the Assignment Booklet.

a. Find the monthly payment on a mortgage of \$10 000 if the amortization period is thirty years and the rate of interest is 10.75% per year.

From the tables the monthly payment on a mortgage of \$1000 under these conditions is \$9.16. Therefore, for \$10 000 the monthly payment is $10 \times \$9.16 = \$91.60$.

b. If this payment is kept constant over the thirty years, how much money is paid in interest?

$$\begin{aligned}\text{Total amount paid} &= \$91.60 \times 12 \times 30 \\ &= \$32\ 976\end{aligned}$$

$$\begin{aligned}\text{Interest} &= \$32\ 976 - \$10\ 000 \\ &= \$22\ 976\end{aligned}$$

(7) 10. a. Find the rate of interest if the monthly payment on a \$1000 mortgage for five years is \$21.27.

From the tables a payment of \$21.27 is paid on a \$1000 mortgage over a period of sixty months (five years) when the rate of interest is $10\frac{1}{4}\%$.

b. What would be the monthly payment if the amount of the mortgage was \$75 000?

The monthly payment on a mortgage of \$75 000 would be $75 \times \$21.27 = \$1595.25$.

**Topic 2**

_____ marks

## Monthly Payment on a $1000 Loan at 10% to 11 3/8% (includes principal and interest)

| Interest Rates | 10% | 10 1/8% | 10 1/4% | 10 3/8% | 10 1/2% | 10 5/8% | 10 3/4% | 10 7/8% | 11% | 11 1/8% | 11 1/4% | 11 3/8% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Terms in Months | | | | | | | | | | | | |
| 1 | 1008.333 | 1008.437 | 1008.542 | 1008.646 | 1008.750 | 1008.854 | 1008.958 | 1009.062 | 1009.167 | 1009.271 | 1009.375 | 1009.479 |
| 2 | 506.259 | 506.337 | 506.415 | 506.494 | 506.572 | 506.650 | 506.729 | 506.807 | 506.885 | 506.964 | 507.042 | 507.121 |
| 3 | 338.904 | 338.974 | 339.044 | 339.114 | 339.184 | 339.253 | 339.323 | 339.393 | 339.463 | 339.533 | 339.603 | 339.673 |
| 4 | 255.230 | 255.296 | 255.361 | 255.427 | 255.493 | 255.558 | 255.624 | 255.690 | 255.755 | 255.821 | 255.887 | 255.952 |
| 5 | 205.028 | 205.091 | 205.154 | 205.217 | 205.280 | 205.344 | 205.407 | 205.470 | 205.533 | 205.597 | 205.660 | 205.723 |
| 6 | 171.561 | 171.623 | 171.685 | 171.746 | 171.808 | 171.870 | 171.931 | 171.993 | 172.055 | 172.116 | 172.178 | 172.240 |
| 7 | 147.659 | 147.719 | 147.780 | 147.840 | 147.901 | 147.961 | 148.022 | 148.082 | 148.143 | 148.204 | 148.264 | 148.325 |
| 8 | 129.733 | 129.793 | 129.852 | 129.912 | 129.972 | 130.032 | 130.091 | 130.151 | 130.211 | 130.271 | 130.331 | 130.391 |
| 9 | 115.792 | 115.851 | 115.910 | 115.969 | 116.029 | 116.088 | 116.147 | 116.206 | 116.266 | 116.325 | 116.384 | 116.444 |
| 10 | 104.640 | 104.699 | 104.758 | 104.817 | 104.875 | 104.934 | 104.993 | 105.052 | 105.111 | 105.170 | 105.228 | 105.287 |
| 11 | 95.517 | 95.576 | 95.634 | 95.693 | 95.751 | 95.810 | 95.868 | 95.927 | 95.985 | 96.044 | 96.102 | 96.161 |
| 12 | 87.916 | 87.974 | 88.032 | 88.090 | 88.149 | 88.207 | 88.265 | 88.323 | 88.382 | 88.440 | 88.498 | 88.557 |
| 13 | 81.485 | 81.543 | 81.601 | 81.659 | 81.717 | 81.775 | 81.833 | 81.891 | 81.949 | 82.007 | 82.065 | 82.124 |
| 14 | 75.973 | 76.031 | 76.089 | 76.147 | 76.205 | 76.262 | 76.320 | 76.378 | 76.436 | 76.494 | 76.552 | 76.610 |
| 15 | 71.197 | 71.255 | 71.313 | 71.370 | 71.428 | 71.486 | 71.544 | 71.602 | 71.660 | 71.718 | 71.775 | 71.833 |
| 16 | 67.019 | 67.077 | 67.134 | 67.192 | 67.250 | 67.307 | 67.365 | 67.423 | 67.481 | 67.539 | 67.597 | 67.655 |
| 17 | 63.333 | 63.390 | 63.448 | 63.506 | 63.563 | 63.621 | 63.679 | 63.737 | 63.795 | 63.852 | 63.910 | 63.968 |
| 18 | 60.057 | 60.115 | 60.172 | 60.230 | 60.288 | 60.345 | 60.403 | 60.461 | 60.519 | 60.576 | 60.634 | 60.692 |
| 19 | 57.127 | 57.184 | 57.242 | 57.299 | 57.357 | 57.415 | 57.473 | 57.530 | 57.588 | 57.646 | 57.704 | 57.762 |
| 20 | 54.490 | 54.547 | 54.605 | 54.663 | 54.720 | 54.778 | 54.836 | 54.894 | 54.951 | 55.009 | 55.067 | 55.125 |
| 21 | 52.105 | 52.162 | 52.220 | 52.278 | 52.335 | 52.393 | 52.451 | 52.509 | 52.567 | 52.624 | 52.682 | 52.740 |
| 22 | 49.937 | 49.995 | 50.052 | 50.110 | 50.168 | 50.226 | 50.283 | 50.341 | 50.399 | 50.457 | 50.515 | 50.573 |
| 23 | 47.958 | 48.016 | 48.074 | 48.131 | 48.189 | 48.247 | 48.305 | 48.363 | 48.421 | 48.479 | 48.537 | 48.595 |
| 24 | 46.145 | 46.203 | 46.260 | 46.318 | 46.376 | 46.434 | 46.492 | 46.550 | 46.608 | 46.666 | 46.724 | 46.782 |
| 25 | 44.477 | 44.535 | 44.593 | 44.651 | 44.708 | 44.766 | 44.824 | 44.882 | 44.940 | 44.999 | 45.057 | 45.115 |
| 26 | 42.938 | 42.996 | 43.054 | 43.112 | 43.170 | 43.228 | 43.286 | 43.344 | 43.402 | 43.460 | 43.518 | 43.577 |
| 27 | 41.513 | 41.571 | 41.629 | 41.687 | 41.745 | 41.803 | 41.861 | 41.920 | 41.978 | 42.036 | 42.095 | 42.153 |
| 28 | 40.191 | 40.249 | 40.307 | 40.365 | 40.423 | 40.481 | 40.539 | 40.598 | 40.656 | 40.714 | 40.773 | 40.831 |
| 29 | 38.960 | 39.018 | 39.076 | 39.134 | 39.192 | 39.251 | 39.309 | 39.367 | 39.426 | 39.484 | 39.543 | 39.601 |
| 30 | 37.811 | 37.870 | 37.928 | 37.986 | 38.044 | 38.103 | 38.161 | 38.220 | 38.278 | 38.337 | 38.395 | 38.454 |
| 31 | 36.737 | 36.796 | 36.854 | 36.912 | 36.971 | 37.029 | 37.088 | 37.146 | 37.205 | 37.263 | 37.322 | 37.381 |
| 32 | 35.731 | 35.789 | 35.848 | 35.906 | 35.965 | 36.023 | 36.082 | 36.140 | 36.199 | 36.258 | 36.317 | 36.376 |
| 33 | 34.786 | 34.844 | 34.903 | 34.961 | 35.020 | 35.078 | 35.137 | 35.196 | 35.255 | 35.314 | 35.373 | 35.432 |
| 34 | 33.896 | 33.955 | 34.014 | 34.072 | 34.131 | 34.190 | 34.248 | 34.307 | 34.366 | 34.425 | 34.484 | 34.543 |
| 35 | 33.058 | 33.117 | 33.176 | 33.234 | 33.293 | 33.352 | 33.411 | 33.470 | 33.529 | 33.588 | 33.647 | 33.707 |
| 36 | 32.267 | 32.326 | 32.385 | 32.444 | 32.502 | 32.561 | 32.620 | 32.680 | 32.739 | 32.798 | 32.857 | 32.917 |
| 37 | 31.519 | 31.578 | 31.637 | 31.696 | 31.755 | 31.814 | 31.873 | 31.932 | 31.991 | 32.051 | 32.110 | 32.170 |
| 38 | 30.811 | 30.870 | 30.929 | 30.988 | 31.047 | 31.106 | 31.165 | 31.225 | 31.284 | 31.343 | 31.403 | 31.462 |
| 39 | 30.139 | 30.198 | 30.257 | 30.316 | 30.375 | 30.435 | 30.494 | 30.553 | 30.613 | 30.673 | 30.732 | 30.792 |
| 40 | 29.501 | 29.560 | 29.619 | 29.678 | 29.738 | 29.797 | 29.857 | 29.916 | 29.976 | 30.036 | 30.095 | 30.155 |

## Monthly Payment on a $1000 Loan at 10% to 11 3/8 % (includes principal and interest) continued

| Interest Rates | 10% | 10 1/8 % | 10 1/4 % | 10 3/8 % | 10 1/2 % | 10 5/8 % | 10 3/4 % | 10 7/8 % | 11% | 11 1/8 % | 11 1/4 % | 11 3/8 % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Terms in Months | | | | | | | | | | | | |
| 41 | 28.894 | 28.953 | 29.013 | 29.072 | 29.132 | 29.191 | 29.251 | 29.311 | 29.370 | 29.430 | 29.490 | 29.550 |
| 42 | 28.317 | 28.376 | 28.436 | 28.495 | 28.555 | 28.614 | 28.674 | 28.734 | 28.794 | 28.854 | 28.914 | 28.974 |
| 43 | 27.767 | 27.826 | 27.886 | 27.945 | 28.005 | 28.065 | 28.125 | 28.185 | 28.245 | 28.305 | 28.365 | 28.425 |
| 44 | 27.242 | 27.301 | 27.361 | 27.421 | 27.480 | 27.540 | 27.600 | 27.660 | 27.720 | 27.781 | 27.841 | 27.901 |
| 45 | 26.740 | 26.800 | 26.860 | 26.919 | 26.979 | 27.039 | 27.100 | 27.160 | 27.220 | 27.280 | 27.341 | 27.401 |
| 46 | 26.261 | 26.321 | 26.380 | 26.440 | 26.501 | 26.561 | 26.621 | 26.681 | 26.742 | 26.802 | 26.863 | 26.923 |
| 47 | 25.802 | 25.862 | 25.922 | 25.982 | 26.042 | 26.103 | 26.163 | 26.223 | 26.284 | 26.345 | 26.405 | 26.466 |
| 48 | 25.363 | 25.423 | 25.483 | 25.543 | 25.603 | 25.664 | 25.724 | 25.785 | 25.846 | 25.906 | 25.967 | 26.028 |
| 49 | 24.941 | 25.002 | 25.062 | 25.122 | 25.183 | 25.243 | 25.304 | 25.365 | 25.425 | 25.486 | 25.547 | 25.608 |
| 50 | 24.537 | 24.598 | 24.658 | 24.718 | 24.779 | 24.840 | 24.900 | 24.961 | 25.022 | 25.083 | 25.144 | 25.205 |
| 51 | 24.149 | 24.210 | 24.270 | 24.331 | 24.391 | 24.452 | 24.513 | 24.574 | 24.635 | 24.696 | 24.758 | 24.819 |
| 52 | 23.776 | 23.837 | 23.897 | 23.958 | 24.019 | 24.080 | 24.141 | 24.202 | 24.263 | 24.325 | 24.386 | 24.447 |
| 53 | 23.418 | 23.478 | 23.539 | 23.600 | 23.661 | 23.722 | 23.783 | 23.844 | 23.906 | 23.967 | 24.029 | 24.090 |
| 54 | 23.072 | 23.133 | 23.194 | 23.255 | 23.316 | 23.377 | 23.439 | 23.500 | 23.561 | 23.623 | 23.685 | 23.746 |
| 55 | 22.740 | 22.801 | 22.862 | 22.923 | 22.984 | 23.046 | 23.107 | 23.169 | 23.230 | 23.292 | 23.354 | 23.416 |
| 56 | 22.420 | 22.481 | 22.542 | 22.603 | 22.664 | 22.726 | 22.787 | 22.849 | 22.911 | 22.973 | 23.035 | 23.097 |
| 57 | 22.111 | 22.172 | 22.233 | 22.295 | 22.356 | 22.418 | 22.479 | 22.541 | 22.603 | 22.665 | 22.727 | 22.789 |
| 58 | 21.813 | 21.874 | 21.935 | 21.997 | 22.059 | 22.120 | 22.182 | 22.244 | 22.306 | 22.368 | 22.430 | 22.493 |
| 59 | 21.525 | 21.586 | 21.648 | 21.710 | 21.771 | 21.833 | 21.895 | 21.957 | 22.019 | 22.082 | 22.144 | 22.206 |
| 60 | 21.247 | 21.309 | 21.370 | 21.432 | 21.494 | 21.556 | 21.618 | 21.680 | 21.742 | 21.805 | 21.867 | 21.930 |
| 61 | 20.978 | 21.040 | 21.102 | 21.164 | 21.226 | 21.288 | 21.350 | 21.412 | 21.475 | 21.537 | 21.600 | 21.663 |
| 62 | 20.719 | 20.780 | 20.842 | 20.904 | 20.966 | 21.029 | 21.091 | 21.153 | 21.216 | 21.279 | 21.342 | 21.404 |
| 63 | 20.467 | 20.529 | 20.591 | 20.653 | 20.716 | 20.778 | 20.840 | 20.903 | 20.966 | 21.029 | 21.091 | 21.154 |
| 64 | 20.224 | 20.286 | 20.348 | 20.410 | 20.473 | 20.535 | 20.598 | 20.661 | 20.723 | 20.786 | 20.849 | 20.913 |
| 65 | 19.998 | 20.050 | 20.113 | 20.175 | 20.238 | 20.300 | 20.363 | 20.426 | 20.489 | 20.552 | 20.615 | 20.678 |
| 66 | 19.760 | 19.822 | 19.884 | 19.947 | 20.010 | 20.072 | 20.135 | 20.198 | 20.261 | 20.325 | 20.388 | 20.452 |
| 67 | 19.538 | 19.601 | 19.663 | 19.726 | 19.789 | 19.852 | 19.915 | 19.978 | 20.041 | 20.105 | 20.168 | 20.232 |
| 68 | 19.324 | 19.386 | 19.449 | 19.512 | 19.575 | 19.638 | 19.701 | 19.764 | 19.827 | 19.891 | 19.955 | 20.018 |
| 69 | 19.115 | 19.178 | 19.241 | 19.304 | 19.367 | 19.430 | 19.493 | 19.557 | 19.620 | 19.684 | 19.748 | 19.812 |
| 70 | 18.913 | 18.976 | 19.039 | 19.102 | 19.165 | 19.228 | 19.292 | 19.355 | 19.419 | 19.483 | 19.547 | 19.611 |
| 71 | 18.717 | 18.780 | 18.843 | 18.906 | 18.969 | 19.033 | 19.096 | 19.160 | 19.224 | 19.288 | 19.352 | 19.416 |
| 72 | 18.526 | 18.589 | 18.652 | 18.716 | 18.779 | 18.843 | 18.906 | 18.970 | 19.034 | 19.098 | 19.162 | 19.227 |
| 73 | 18.340 | 18.404 | 18.467 | 18.531 | 18.594 | 18.658 | 18.722 | 18.786 | 18.850 | 18.914 | 18.978 | 19.043 |
| 74 | 18.160 | 18.224 | 18.287 | 18.351 | 18.414 | 18.478 | 18.542 | 18.606 | 18.671 | 18.735 | 18.799 | 18.864 |
| 75 | 17.985 | 18.048 | 18.112 | 18.176 | 18.240 | 18.304 | 18.368 | 18.432 | 18.496 | 18.561 | 18.626 | 18.690 |
| 76 | 17.814 | 17.878 | 17.942 | 18.006 | 18.070 | 18.134 | 18.198 | 18.262 | 18.327 | 18.392 | 18.456 | 18.521 |
| 77 | 17.648 | 17.712 | 17.776 | 17.840 | 17.904 | 17.969 | 18.033 | 18.097 | 18.162 | 18.227 | 18.292 | 18.357 |
| 78 | 17.487 | 17.551 | 17.615 | 17.679 | 17.743 | 17.808 | 17.872 | 17.937 | 18.002 | 18.067 | 18.132 | 18.197 |
| 79 | 17.330 | 17.394 | 17.458 | 17.522 | 17.586 | 17.651 | 17.716 | 17.780 | 17.845 | 17.911 | 17.976 | 18.041 |
| 80 | 17.176 | 17.241 | 17.305 | 17.369 | 17.434 | 17.498 | 17.563 | 17.628 | 17.693 | 17.759 | 17.824 | 17.889 |
| 81 | 17.027 | 17.091 | 17.156 | 17.220 | 17.285 | 17.350 | 17.415 | 17.480 | 17.545 | 17.610 | 17.676 | 17.742 |
| 82 | 16.881 | 16.946 | 17.010 | 17.075 | 17.140 | 17.205 | 17.270 | 17.335 | 17.401 | 17.466 | 17.532 | 17.598 |
| 83 | 16.740 | 16.804 | 16.869 | 16.934 | 16.999 | 17.064 | 17.129 | 17.194 | 17.260 | 17.325 | 17.391 | 17.457 |
| 84 | 16.601 | 16.666 | 16.731 | 16.796 | 16.861 | 16.926 | 16.991 | 17.057 | 17.122 | 17.188 | 17.254 | 17.320 |
| 85 | 16.466 | 16.531 | 16.596 | 16.661 | 16.726 | 16.792 | 16.857 | 16.923 | 16.989 | 17.054 | 17.121 | 17.187 |
| 86 | 16.334 | 16.399 | 16.464 | 16.530 | 16.595 | 16.660 | 16.726 | 16.792 | 16.858 | 16.924 | 16.990 | 17.057 |
| 87 | 16.206 | 16.271 | 16.336 | 16.401 | 16.467 | 16.533 | 16.598 | 16.664 | 16.730 | 16.797 | 16.863 | 16.929 |
| 88 | 16.080 | 16.145 | 16.211 | 16.276 | 16.342 | 16.408 | 16.474 | 16.540 | 16.606 | 16.672 | 16.739 | 16.805 |

## Monthly Payment on a $1000 Loan at $11\frac{1}{2}\%$ to $12\frac{7}{8}\%$ (includes principal and interest)

| Interest Rates | $11\frac{1}{2}\%$ | $11\frac{5}{8}\%$ | $11\frac{3}{4}\%$ | $11\frac{7}{8}\%$ | 12% | $12\frac{1}{8}\%$ | $12\frac{1}{4}\%$ | $12\frac{3}{8}\%$ | $12\frac{1}{2}\%$ | $12\frac{5}{8}\%$ | $12\frac{3}{4}\%$ | $12\frac{7}{8}\%$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Terms in Months | | | | | | | | | | | | |
| 1 | 1009.583 | 1009.687 | 1009.792 | 1009.896 | 1010.000 | 1010.104 | 1010.208 | 1010.312 | 1010.417 | 1010.521 | 1010.625 | 1010.729 |
| 2 | 507.199 | 507.277 | 507.356 | 507.434 | 507.512 | 507.591 | 507.669 | 507.748 | 507.826 | 507.904 | 507.983 | 508.061 |
| 3 | 339.743 | 339.812 | 339.882 | 339.952 | 340.022 | 340.092 | 340.162 | 340.232 | 340.302 | 340.372 | 340.442 | 340.512 |
| 4 | 256.018 | 256.084 | 256.150 | 256.215 | 256.281 | 256.347 | 256.413 | 256.478 | 256.544 | 256.610 | 256.676 | 256.742 |
| 5 | 205.787 | 205.850 | 205.913 | 205.976 | 206.040 | 206.103 | 206.166 | 206.230 | 206.293 | 206.357 | 206.420 | 206.483 |
| 6 | 172.301 | 172.363 | 172.425 | 172.487 | 172.548 | 172.610 | 172.672 | 172.734 | 172.796 | 172.857 | 172.919 | 172.981 |
| 7 | 148.386 | 148.446 | 148.507 | 148.568 | 148.628 | 148.689 | 148.750 | 148.810 | 148.871 | 148.932 | 148.993 | 149.054 |
| 8 | 130.451 | 130.511 | 130.570 | 130.630 | 130.690 | 130.750 | 130.810 | 130.870 | 130.930 | 130.990 | 131.050 | 131.110 |
| 9 | 116.503 | 116.562 | 116.622 | 116.681 | 116.740 | 116.800 | 116.859 | 116.919 | 116.978 | 117.038 | 117.097 | 117.157 |
| 10 | 105.346 | 105.405 | 105.464 | 105.523 | 105.582 | 105.641 | 105.700 | 105.759 | 105.818 | 105.877 | 105.936 | 105.995 |
| 11 | 96.219 | 96.278 | 96.337 | 96.395 | 96.454 | 96.513 | 96.572 | 96.630 | 96.689 | 96.748 | 96.807 | 96.865 |
| 12 | 88.615 | 88.673 | 88.732 | 88.790 | 88.849 | 88.907 | 88.966 | 89.024 | 89.083 | 89.141 | 89.200 | 89.259 |
| 13 | 82.182 | 82.240 | 82.298 | 82.357 | 82.415 | 82.473 | 82.531 | 82.590 | 82.648 | 82.707 | 82.765 | 82.824 |
| 14 | 76.669 | 76.727 | 76.785 | 76.843 | 76.901 | 76.959 | 77.018 | 77.076 | 77.134 | 77.192 | 77.251 | 77.309 |
| 15 | 71.891 | 71.950 | 72.008 | 72.066 | 72.124 | 72.182 | 72.240 | 72.298 | 72.357 | 72.415 | 72.473 | 72.531 |
| 16 | 67.712 | 67.770 | 67.828 | 67.887 | 67.945 | 68.003 | 68.061 | 68.119 | 68.177 | 68.235 | 68.294 | 68.352 |
| 17 | 64.026 | 64.084 | 64.142 | 64.200 | 64.258 | 64.316 | 64.374 | 64.432 | 64.491 | 64.549 | 64.607 | 64.665 |
| 18 | 60.750 | 60.808 | 60.866 | 60.924 | 60.982 | 61.040 | 61.098 | 61.156 | 61.215 | 61.273 | 61.331 | 61.389 |
| 19 | 57.820 | 57.878 | 57.936 | 57.994 | 58.052 | 58.110 | 58.168 | 58.226 | 58.284 | 58.343 | 58.401 | 58.459 |
| 20 | 55.183 | 55.241 | 55.299 | 55.357 | 55.415 | 55.473 | 55.532 | 55.590 | 55.648 | 55.706 | 55.765 | 55.823 |
| 21 | 52.798 | 52.856 | 52.914 | 52.973 | 53.031 | 53.089 | 53.147 | 53.205 | 53.264 | 53.322 | 53.380 | 53.439 |
| 22 | 50.631 | 50.689 | 50.747 | 50.806 | 50.864 | 50.922 | 50.980 | 51.039 | 51.097 | 51.155 | 51.214 | 51.272 |
| 23 | 48.653 | 48.711 | 48.769 | 48.828 | 48.886 | 48.944 | 49.003 | 49.061 | 49.119 | 49.178 | 49.236 | 49.295 |
| 24 | 46.840 | 46.899 | 46.957 | 47.015 | 47.073 | 47.132 | 47.190 | 47.249 | 47.307 | 47.366 | 47.424 | 47.483 |
| 25 | 45.173 | 45.232 | 45.290 | 45.348 | 45.407 | 45.465 | 45.524 | 45.582 | 45.641 | 45.700 | 45.758 | 45.817 |
| 26 | 43.635 | 43.693 | 43.752 | 43.810 | 43.869 | 43.927 | 43.986 | 44.045 | 44.103 | 44.162 | 44.221 | 44.280 |
| 27 | 42.211 | 42.270 | 42.328 | 42.387 | 42.446 | 42.504 | 42.563 | 42.622 | 42.680 | 42.739 | 42.798 | 42.857 |
| 28 | 40.890 | 40.948 | 41.007 | 41.066 | 41.124 | 41.183 | 41.242 | 41.301 | 41.360 | 41.419 | 41.478 | 41.537 |
| 29 | 39.660 | 39.719 | 39.777 | 39.836 | 39.895 | 39.954 | 40.013 | 40.072 | 40.131 | 40.190 | 40.249 | 40.308 |
| 30 | 38.513 | 38.571 | 38.630 | 38.689 | 38.748 | 38.807 | 38.866 | 38.925 | 38.984 | 39.044 | 39.103 | 39.162 |
| 31 | 37.440 | 37.499 | 37.558 | 37.617 | 37.676 | 37.735 | 37.794 | 37.853 | 37.912 | 37.972 | 38.031 | 38.091 |
| 32 | 36.435 | 36.494 | 36.553 | 36.612 | 36.671 | 36.730 | 36.789 | 36.849 | 36.908 | 36.968 | 37.027 | 37.087 |
| 33 | 35.491 | 35.550 | 35.609 | 35.668 | 35.727 | 35.787 | 35.846 | 35.906 | 35.965 | 36.025 | 36.084 | 36.144 |
| 34 | 34.603 | 34.662 | 34.721 | 34.781 | 34.840 | 34.899 | 34.959 | 35.019 | 35.078 | 35.138 | 35.198 | 35.258 |
| 35 | 33.766 | 33.825 | 33.885 | 33.944 | 34.004 | 34.063 | 34.123 | 34.183 | 34.242 | 34.302 | 34.362 | 34.422 |
| 36 | 32.976 | 33.035 | 33.095 | 33.155 | 33.214 | 33.274 | 33.334 | 33.394 | 33.454 | 33.514 | 33.574 | 33.634 |
| 37 | 32.229 | 32.289 | 32.349 | 32.408 | 32.468 | 32.528 | 32.588 | 32.648 | 32.708 | 32.768 | 32.828 | 32.888 |
| 38 | 31.522 | 31.582 | 31.642 | 31.702 | 31.761 | 31.821 | 31.882 | 31.942 | 32.002 | 32.062 | 32.122 | 32.183 |
| 39 | 30.852 | 30.912 | 30.972 | 31.032 | 31.092 | 31.152 | 31.212 | 31.272 | 31.333 | 31.393 | 31.453 | 31.514 |
| 40 | 30.215 | 30.275 | 30.335 | 30.395 | 30.456 | 30.516 | 30.576 | 30.637 | 30.697 | 30.758 | 30.818 | 30.879 |

## Monthly Payment on a $1000 Loan at $11\frac{1}{2}\%$ to $12\frac{7}{8}\%$ (includes principal and interest) continued

| Interest Rates | $11\frac{1}{2}\%$ | $11\frac{5}{8}\%$ | $11\frac{3}{4}\%$ | $11\frac{7}{8}\%$ | 12% | $12\frac{1}{8}\%$ | $12\frac{1}{4}\%$ | $12\frac{3}{8}\%$ | $12\frac{1}{2}\%$ | $12\frac{5}{8}\%$ | $12\frac{3}{4}\%$ | $12\frac{7}{8}\%$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Terms in Months | | | | | | | | | | | | |
| 41 | 29.610 | 29.670 | 29.730 | 29.791 | 29.851 | 29.911 | 29.972 | 30.032 | 30.093 | 30.154 | 30.215 | 30.275 |
| 42 | 29.034 | 29.094 | 29.155 | 29.215 | 29.276 | 29.336 | 29.397 | 29.458 | 29.518 | 29.579 | 29.640 | 29.701 |
| 43 | 28.485 | 28.546 | 28.606 | 28.667 | 28.727 | 28.788 | 28.849 | 28.910 | 28.971 | 29.032 | 29.093 | 29.154 |
| 44 | 27.962 | 28.022 | 28.083 | 28.144 | 28.204 | 28.265 | 28.326 | 28.387 | 28.448 | 28.509 | 28.571 | 28.632 |
| 45 | 27.462 | 27.523 | 27.583 | 27.644 | 27.705 | 27.766 | 27.827 | 27.888 | 27.949 | 28.011 | 28.072 | 28.134 |
| 46 | 26.984 | 27.045 | 27.106 | 27.167 | 27.228 | 27.289 | 27.350 | 27.411 | 27.473 | 27.534 | 27.596 | 27.657 |
| 47 | 26.527 | 26.588 | 26.649 | 26.710 | 26.771 | 26.832 | 26.894 | 26.955 | 27.017 | 27.078 | 27.140 | 27.202 |
| 48 | 26.089 | 26.150 | 26.211 | 26.273 | 26.334 | 26.395 | 26.457 | 26.518 | 26.580 | 26.642 | 26.704 | 26.765 |
| 49 | 25.669 | 25.731 | 25.792 | 25.853 | 25.915 | 25.976 | 26.038 | 26.100 | 26.162 | 26.223 | 26.285 | 26.347 |
| 50 | 25.267 | 25.328 | 25.390 | 25.451 | 25.513 | 25.574 | 25.636 | 25.698 | 25.760 | 25.822 | 25.884 | 25.947 |
| 51 | 24.880 | 24.942 | 25.003 | 25.065 | 25.127 | 25.189 | 25.251 | 25.313 | 25.375 | 25.437 | 25.499 | 25.562 |
| 52 | 24.509 | 24.571 | 24.632 | 24.694 | 24.756 | 24.818 | 24.880 | 24.942 | 25.005 | 25.067 | 25.129 | 25.192 |
| 53 | 24.152 | 24.214 | 24.276 | 24.337 | 24.400 | 24.462 | 24.524 | 24.586 | 24.649 | 24.711 | 24.774 | 24.837 |
| 54 | 23.808 | 23.870 | 23.932 | 23.994 | 24.057 | 24.119 | 24.181 | 24.244 | 24.306 | 24.369 | 24.432 | 24.495 |
| 55 | 23.477 | 23.540 | 23.602 | 23.664 | 23.726 | 23.789 | 23.851 | 23.914 | 23.977 | 24.040 | 24.103 | 24.166 |
| 56 | 23.159 | 23.221 | 23.283 | 23.346 | 23.408 | 23.471 | 23.534 | 23.596 | 23.659 | 23.722 | 23.785 | 23.849 |
| 57 | 22.851 | 22.914 | 22.976 | 23.039 | 23.102 | 23.164 | 23.227 | 23.290 | 23.353 | 23.416 | 23.480 | 23.543 |
| 58 | 22.555 | 22.618 | 22.680 | 22.743 | 22.806 | 22.869 | 22.932 | 22.995 | 23.058 | 23.121 | 23.185 | 23.248 |
| 59 | 22.269 | 22.332 | 22.394 | 22.457 | 22.520 | 22.583 | 22.646 | 22.710 | 22.773 | 22.837 | 22.900 | 22.964 |
| 60 | 21.993 | 22.055 | 22.118 | 22.181 | 22.244 | 22.308 | 22.371 | 22.434 | 22.498 | 22.562 | 22.625 | 22.689 |
| 61 | 21.726 | 21.789 | 21.852 | 21.915 | 21.978 | 22.041 | 22.105 | 22.168 | 22.232 | 22.296 | 22.360 | 22.424 |
| 62 | 21.467 | 21.530 | 21.594 | 21.657 | 21.720 | 21.784 | 21.848 | 21.911 | 21.975 | 22.039 | 22.103 | 22.167 |
| 63 | 21.218 | 21.281 | 21.344 | 21.408 | 21.471 | 21.535 | 21.599 | 21.663 | 21.727 | 21.791 | 21.855 | 21.919 |
| 64 | 20.976 | 21.039 | 21.103 | 21.166 | 21.230 | 21.294 | 21.358 | 21.422 | 21.486 | 21.550 | 21.615 | 21.679 |
| 65 | 20.742 | 20.805 | 20.869 | 20.933 | 20.997 | 21.061 | 21.125 | 21.189 | 21.253 | 21.318 | 21.382 | 21.447 |
| 66 | 20.515 | 20.579 | 20.643 | 20.706 | 20.771 | 20.835 | 20.899 | 20.963 | 21.028 | 21.092 | 21.157 | 21.222 |
| 67 | 20.295 | 20.359 | 20.423 | 20.487 | 20.551 | 20.616 | 20.680 | 20.745 | 20.809 | 20.874 | 20.939 | 21.004 |
| 68 | 20.082 | 20.146 | 20.210 | 20.275 | 20.339 | 20.403 | 20.468 | 20.533 | 20.597 | 20.662 | 20.727 | 20.792 |
| 69 | 19.876 | 19.940 | 20.004 | 20.068 | 20.133 | 20.197 | 20.262 | 20.327 | 20.392 | 20.457 | 20.522 | 20.587 |
| 70 | 19.675 | 19.739 | 19.804 | 19.868 | 19.933 | 19.998 | 20.062 | 20.127 | 20.193 | 20.258 | 20.323 | 20.389 |
| 71 | 19.480 | 19.545 | 19.609 | 19.674 | 19.739 | 19.804 | 19.869 | 19.934 | 19.999 | 20.064 | 20.130 | 20.196 |
| 72 | 19.291 | 19.356 | 19.420 | 19.485 | 19.550 | 19.615 | 19.680 | 19.746 | 19.811 | 19.877 | 19.942 | 20.008 |
| 73 | 19.107 | 19.172 | 19.237 | 19.302 | 19.367 | 19.432 | 19.498 | 19.563 | 19.629 | 19.694 | 19.760 | 19.826 |
| 74 | 18.929 | 18.994 | 19.059 | 19.124 | 19.189 | 19.254 | 19.320 | 19.386 | 19.451 | 19.517 | 19.583 | 19.649 |
| 75 | 18.755 | 18.820 | 18.885 | 18.951 | 19.016 | 19.082 | 19.147 | 19.213 | 19.279 | 19.345 | 19.411 | 19.477 |
| 76 | 18.586 | 18.652 | 18.717 | 18.782 | 18.848 | 18.914 | 18.979 | 19.045 | 19.111 | 19.178 | 19.244 | 19.310 |
| 77 | 18.422 | 18.487 | 18.553 | 18.618 | 18.684 | 18.750 | 18.816 | 18.882 | 18.948 | 19.015 | 19.081 | 19.148 |
| 78 | 18.262 | 18.328 | 18.393 | 18.459 | 18.525 | 18.591 | 18.657 | 18.723 | 18.790 | 18.856 | 18.923 | 18.990 |
| 79 | 18.107 | 18.172 | 18.238 | 18.304 | 18.370 | 18.436 | 18.502 | 18.569 | 18.635 | 18.702 | 18.769 | 18.836 |
| 80 | 17.955 | 18.021 | 18.087 | 18.153 | 18.219 | 18.285 | 18.352 | 18.418 | 18.485 | 18.552 | 18.619 | 18.686 |
| 81 | 17.807 | 17.873 | 17.939 | 18.005 | 18.072 | 18.138 | 18.205 | 18.272 | 18.338 | 18.405 | 18.473 | 18.540 |
| 82 | 17.663 | 17.730 | 17.796 | 17.862 | 17.929 | 17.995 | 18.062 | 18.129 | 18.196 | 18.263 | 18.330 | 18.398 |
| 83 | 17.523 | 17.589 | 17.656 | 17.722 | 17.789 | 17.856 | 17.923 | 17.990 | 18.057 | 18.124 | 18.192 | 18.259 |
| 84 | 17.386 | 17.453 | 17.519 | 17.586 | 17.653 | 17.720 | 17.787 | 17.854 | 17.921 | 17.989 | 18.056 | 18.124 |
| 85 | 17.253 | 17.320 | 17.386 | 17.453 | 17.520 | 17.587 | 17.654 | 17.722 | 17.789 | 17.857 | 17.925 | 17.992 |
| 86 | 17.123 | 17.190 | 17.256 | 17.323 | | | | | | | | |
| 87 | 16.996 | 17.063 | 17.130 | 17.197 | | | | | | | | |
| 88 | 16.872 | 16.939 | 17.006 | 17.074 | | | | | | | | |

## Monthly Payments Including Principal and Interest for a Mortgage of $1000

| YEARS | 1 | 2 | 3 | 4 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RATE | | | | | | | | | | | |
| 8 | 86.93 | 45.17 | 31.28 | 24.35 | 20.21 | 12.06 | 9.48 | 8.28 | 7.63 | 7.25 | 7.01 |
| 8 1/4 | 87.04 | 45.28 | 31.39 | 24.47 | 20.33 | 12.19 | 9.62 | 8.43 | 7.79 | 7.42 | 7.18 |
| 8 1/2 | 87.15 | 45.39 | 31.50 | 24.58 | 20.45 | 12.32 | 9.76 | 8.59 | 7.96 | 7.59 | 7.37 |
| 8 3/4 | 87.27 | 45.50 | 31.61 | 24.69 | 20.56 | 12.45 | 9.90 | 8.74 | 8.12 | 7.76 | 7.54 |
| 9 | 87.38 | 45.61 | 31.72 | 24.81 | 20.69 | 12.58 | 10.05 | 8.89 | 8.28 | 7.93 | 7.72 |
| 9 1/4 | 87.49 | 45.72 | 31.84 | 24.92 | 20.80 | 12.71 | 10.19 | 9.05 | 8.44 | 8.10 | 7.90 |
| 9 1/2 | 87.60 | 45.83 | 31.95 | 25.03 | 20.91 | 12.84 | 10.33 | 9.20 | 8.61 | 8.28 | 8.08 |
| 9 3/4 | 87.71 | 45.94 | 32.06 | 25.15 | 21.03 | 12.97 | 10.48 | 9.36 | 8.78 | 8.45 | 8.26 |
| 10 | 87.82 | 46.05 | 32.17 | 25.26 | 21.15 | 13.10 | 10.62 | 9.52 | 8.94 | 8.63 | 8.44 |
| 10 1/4 | 87.93 | 46.16 | 32.28 | 25.38 | 21.27 | 13.24 | 10.77 | 9.68 | 9.11 | 8.80 | 8.63 |
| 10 1/2 | 88.04 | 46.27 | 32.40 | 25.50 | 21.38 | 13.37 | 10.92 | 9.83 | 9.28 | 8.98 | 8.81 |
| 10 3/4 | 88.16 | 46.38 | 32.51 | 25.61 | 21.50 | 13.50 | 11.06 | 10.00 | 9.45 | 9.16 | 8.99 |
| 11 | 88.27 | 46.49 | 32.62 | 25.73 | 21.62 | 13.64 | 11.21 | 10.16 | 9.63 | 9.34 | 9.18 |
| 11 1/4 | 88.38 | 46.61 | 32.74 | 25.84 | 21.74 | 13.77 | 11.36 | 10.32 | 9.80 | 9.52 | 9.37 |
| 11 1/2 | 88.49 | 46.72 | 32.85 | 25.96 | 21.86 | 13.91 | 11.51 | 10.48 | 9.97 | 9.70 | 9.55 |
| 11 3/4 | 88.60 | 46.83 | 32.96 | 26.08 | 21.98 | 14.04 | 11.66 | 10.65 | 10.14 | 9.88 | 9.74 |
| 12 | 88.71 | 46.94 | 33.08 | 26.19 | 22.10 | 14.18 | 11.82 | 10.81 | 10.32 | 10.06 | 9.93 |
| 12 1/4 | 88.83 | 47.05 | 33.19 | 26.31 | 22.22 | 14.32 | 11.97 | 10.98 | 10.50 | 10.25 | 10.12 |
| 12 1/2 | 88.94 | 47.17 | 33.31 | 26.43 | 22.34 | 14.46 | 12.13 | 11.15 | 10.68 | 10.43 | 10.31 |
| 12 3/4 | 89.05 | 47.28 | 33.42 | 26.55 | 22.46 | 14.60 | 12.28 | 11.31 | 10.85 | 10.62 | 10.50 |
| 13 | 89.16 | 47.39 | 33.54 | 26.66 | 22.59 | 14.74 | 12.44 | 11.48 | 11.03 | 10.97 | 10.69 |
| 13 1/4 | 89.27 | 47.50 | 33.65 | 26.78 | 22.71 | 14.88 | 12.59 | 11.65 | 11.21 | 10.99 | 10.88 |
| 13 1/2 | 89.39 | 47.61 | 33.76 | 26.90 | 22.83 | 15.02 | 12.75 | 11.82 | 11.38 | 11.17 | 11.07 |
| 13 3/4 | 89.50 | 47.72 | 33.88 | 27.02 | 22.95 | 15.16 | 12.90 | 11.99 | 11.56 | 11.36 | 11.26 |
| 14 | 89.61 | 47.83 | 33.99 | 27.14 | 23.07 | 15.30 | 13.06 | 12.16 | 11.74 | 11.54 | 11.45 |
| 14 1/4 | 89.72 | 47.94 | 34.11 | 27.25 | 23.19 | 15.44 | 13.22 | 12.33 | 11.92 | 11.73 | 11.64 |
| 14 1/2 | 89.93 | 48.06 | 34.22 | 27.37 | 23.31 | 15.58 | 13.38 | 12.50 | 12.10 | 11.92 | 11.83 |
| 14 3/4 | 89.94 | 48.17 | 34.34 | 27.49 | 23.44 | 15.72 | 13.54 | 12.67 | 12.29 | 12.10 | 12.02 |
| 15 | 90.05 | 48.28 | 34.45 | 27.61 | 23.56 | 15.87 | 13.70 | 12.84 | 12.47 | 12.29 | 12.21 |
| 15 1/4 | 90.16 | 48.39 | 34.57 | 27.73 | 23.68 | 16.01 | 13.86 | 13.02 | 12.65 | 12.48 | 12.40 |
| 15 1/2 | 90.27 | 48.50 | 34.68 | 27.85 | 23.81 | 16.15 | 14.02 | 13.19 | 12.83 | 12.67 | 12.59 |
| 15 3/4 | 90.38 | 48.61 | 34.80 | 27.97 | 23.93 | 16.30 | 14.18 | 13.36 | 13.01 | 12.86 | 12.78 |
| 16 | 90.50 | 48.73 | 34.91 | 28.09 | 24.05 | 16.44 | 14.34 | 13.54 | 13.20 | 13.04 | 12.97 |
| 16 1/4 | 90.61 | 48.84 | 35.03 | 28.20 | 24.18 | 16.59 | 14.50 | 13.71 | 13.38 | 13.23 | 13.17 |
| 16 1/2 | 90.72 | 48.95 | 35.14 | 28.32 | 24.30 | 16.73 | 14.66 | 13.89 | 13.56 | 13.42 | 13.36 |
| 16 3/4 | 90.83 | 49.06 | 35.26 | 28.44 | 24.43 | 16.88 | 14.83 | 14.06 | 13.75 | 13.61 | 13.55 |
| 17 | 90.94 | 49.17 | 35.37 | 28.56 | 24.55 | 17.02 | 14.99 | 14.24 | 13.93 | 13.80 | 13.74 |
| 17 1/4 | 91.05 | 49.28 | 35.49 | 28.68 | 24.68 | 17.17 | 15.16 | 14.42 | 14.11 | 13.99 | 13.93 |
| 17 1/2 | 91.16 | 49.40 | 35.61 | 28.81 | 24.80 | 17.32 | 15.32 | 14.59 | 14.30 | 14.18 | 14.12 |
| 17 3/4 | 91.27 | 49.51 | 35.72 | 28.93 | 24.93 | 17.47 | 15.49 | 14.77 | 14.48 | 14.36 | 14.31 |
| 18 | 91.38 | 49.62 | 35.84 | 29.05 | 25.05 | 17.61 | 15.65 | 14.95 | 14.67 | 14.55 | 14.51 |
| 18 1/4 | 91.49 | 49.73 | 35.95 | 29.17 | 25.18 | 17.76 | 15.82 | 15.13 | 14.85 | 14.74 | 14.70 |
| 18 1/2 | 91.60 | 49.84 | 36.07 | 29.29 | 25.30 | 17.91 | 15.98 | 15.30 | 15.04 | 14.93 | 14.89 |
| 18 3/4 | 91.71 | 49.96 | 36.19 | 29.41 | 25.43 | 18.06 | 16.15 | 15.48 | 15.23 | 15.12 | 15.08 |
| 19 | 91.82 | 50.07 | 36.30 | 29.53 | 25.56 | 18.21 | 16.32 | 15.66 | 15.41 | 15.31 | 15.27 |
| 19 1/4 | 91.93 | 50.18 | 36.42 | 29.65 | 25.68 | 18.36 | 16.49 | 15.84 | 15.60 | 15.50 | 15.46 |
| 19 1/2 | 92.04 | 50.29 | 36.54 | 29.77 | 25.81 | 18.51 | 16.65 | 16.02 | 15.78 | 15.69 | 15.65 |
| 19 3/4 | 92.15 | 50.41 | 36.65 | 29.90 | 25.94 | 18.66 | 16.82 | 16.20 | 15.97 | 15.88 | 15.85 |
| 20 | 92.26 | 50.52 | 36.77 | 30.02 | 26.06 | 18.81 | 16.99 | 16.38 | 16.15 | 16.07 | 16.04 |

# Final Test

There are two copies of the final test: the student's copy which is perforated and designed for photocopying and possible faxing and the teacher's copy which includes a marking guide.

**Note:**

The student's copy of this final test should be kept secure by the teacher. Students should not have access to this test until it is assigned in a supervised situation. The answers should be stored securely and retained by the teacher at all times.

# MATHEMATICS 33

## FINAL TEST

## GENERAL INSTRUCTIONS

1. The time limit for this test is **$2\frac{1}{2}$ hours.**

2. There are **100 marks** on this test.

   PART A: Multiple Choice - 50 marks

   PART B: Written Response - 50 marks

3. Calculators that are not programmed may be used.

4. All necessary tables and a list of formulas have been provided at the end of the test.

5. It is better to complete all work which you know well first. After that you can deal with the difficult ones. Do not spend too much time on any one problem. If you finish the test before the $2\frac{1}{2}$ hour time limit, go back and check your answers.

# PART A: MULTIPLE CHOICE

In each of the questions, indicate the correct answer by placing the appropriate letter A, B, C, or D in the blank provided.

Example:

__B__ The value of $2^3$ is

A. 6

B. 8

C. $-8$

D. $-6$

__C__ 1. Which one of the following does NOT contain like radicals?

A. $12\sqrt{12}$ and $15\sqrt{3}$

B. $17\sqrt{2}$ and $4\sqrt{8}$

C. $3\sqrt{15}$ and $5\sqrt{5}$

D. $4\sqrt{5}$ and $2\sqrt{20}$

__D__ 2. The simplest form of $8\sqrt{3} \times 3\sqrt{6}$ is

A. $\sqrt{324}$

B. $18\sqrt{6}$

C. $36\sqrt{2}$

D. $72\sqrt{2}$

B 3. Simplify $\frac{16}{2-\sqrt{2}}$.

A. $16-8\sqrt{2}$

B. $16+8\sqrt{2}$

C. $32+16\sqrt{2}$

D. $32\sqrt{2}$

B 4. Which of the following expressions is NOT a rational expression?

A. $\frac{5x^3-x+3}{x-4}$

B. $\frac{3x^{\frac{3}{2}}-2x^{\frac{1}{2}}-2}{x-2}$

C. $\frac{3x^{\frac{6}{2}}-2x^{\frac{2}{2}}-1}{x-2}$

D. $\frac{3x^6-2x+3}{x-4}$

C 5. Reduce $\frac{(16-x^2)(x+4)}{x^2+8x+16}$ to its lowest terms. The result is

A. $x+4$

B. $x-4$

C. $4-x$

D. $-(x+4)$

B 6. Find the value of $x$ in the equation $\frac{11}{2}-\frac{2}{x}=\frac{1}{x}+1$ where $x \neq 0$.

A. $x=\frac{1}{3}$

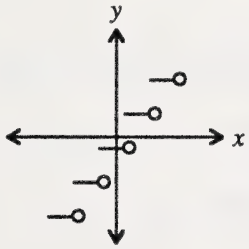
B. $x=\frac{2}{3}$

C. $x=\frac{3}{2}$

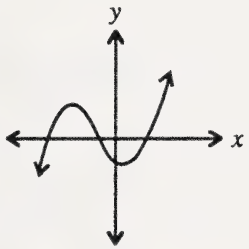
D. $x=2$

D 7. Which of the following graphs is NOT a function?

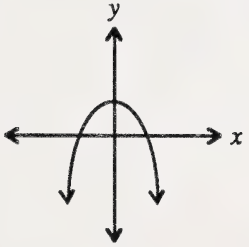
A.



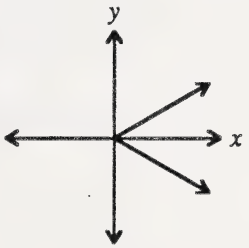

B.




C.




D.



A 8. Which one of the following statements is false with respect to the equation $y=3(x-1)^2$?

A. The axis of symmetry is $x=-1$.

B. The domain is $R$.

C. The vertex is at $(1,0)$.

D. The graph opens upwards.

B 9. Which one of the following is the general equation for a parabola?

A. $y=a(x+k)^2-h$

B. $y=a(x-h)^2+k$

C. $y=a(x+h)^2-k$

D. $y=a(x-k)^2+h$

D 10. Which of the following are the solutions to the quadratic equation $2x^2+5x=33$?

A. $-5\frac{1}{2}$ and $-3$

B. $\frac{11}{2}$ and 3

C. $-3$ and $5\frac{1}{2}$

D. $-\frac{11}{2}$ and 3

B 11. Use the quadratic formula to establish that the roots of $x^2 + 3x = 5x - x^2 + 2$ are

A. $\frac{1 \pm \sqrt{-5}}{2}$

B. $\frac{1 \pm \sqrt{5}}{2}$

C. $\frac{-1 \pm \sqrt{-5}}{2}$

D. $\frac{-1 \pm \sqrt{5}}{2}$

D 12. What are the coordinates of the vertex for the function $y = -5(x+2)^2 + 3$?

A. $(2, -3)$

B. $(2, 3)$

C. $(-2, -3)$

D. $(-2, 3)$

A 13. What is the general equation for secant?

A. $\sec\theta = \frac{r}{x}$

B. $\sec\theta = \frac{r}{y}$

C. $\sec\theta = \frac{x}{y}$

D. $\sec\theta = \frac{y}{x}$

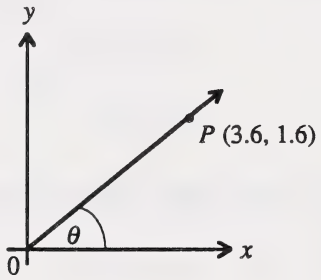
B 14. If $P(3.6, 1.6)$ is a point on the grid, and $\theta$ is the angle formed by $\overrightarrow{OP}$ and the horizontal, calculate $\sin\theta$ to four decimal places.

A. 0.9095

B. 0.4061

C. 0.4158

D. 0.5140




B 15. Triangle $ABC$ is an obtuse triangle in which $\angle B = 40°$, $AC = 8$ cm, and $BC = 11$ cm. Determine $\angle A$ to the nearest degree.

A. 50°

B. 62°

C. 54°

D. 47°

D 16. The value of cot 352° is equal to

A. cot 92°

B. −cot 92°

C. cot 8°

D. −cot 8°

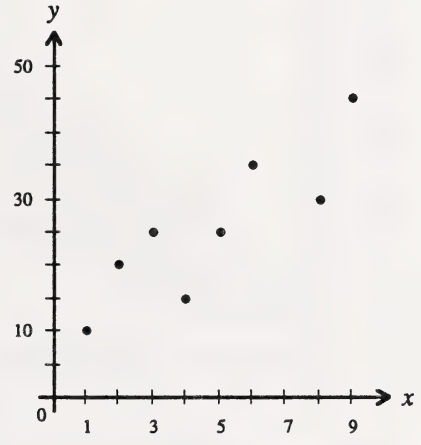
B 17. What plot is depicted by the following?

A. hinge-box plot

B. scatter plot

C. whisker-box plot

D. stem-leaf plot




C 18. What measure of central tendency is used for constructing a box and whisker plot?

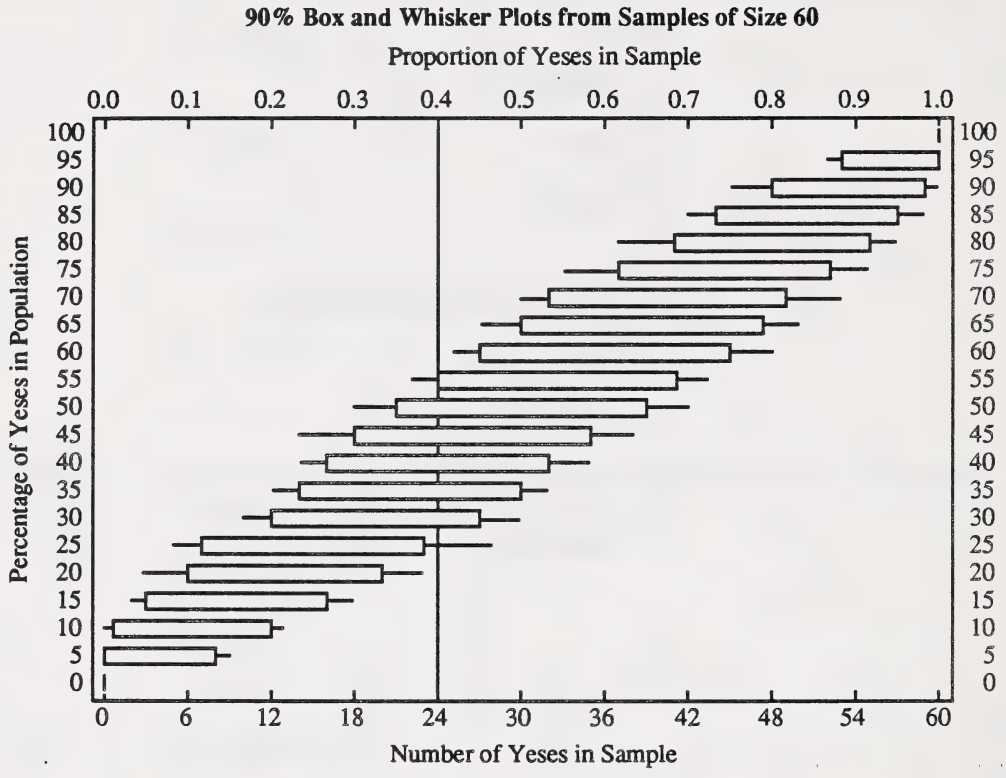
A. mode

B. percentile

C. median

D. mean

Answer questions 19 and 20 using the following chart.


90% Box and Whisker Plots from Samples of Size 60
Proportion of Yeses in Sample
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Percentage of Yeses in Population
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
0 6 12 18 24 30 36 42 48 54 60
Number of Yeses in Sample

A

19. A pharmaceutical company has data from a sample of 60 people in which 24 of the people responded favourably. What population percentages are likely for this situation?

A. 30 - 55

B. 50 - 70

C. 15 - 35

D. 80 - 95

C 20. What is the range of the number of yeses for a population percentage of 65?

A. 27 - 50

B. 30 - 50

C. 30 - 47

D. 27 - 47

C 21. The formula for the amount of an annuity is

A. $\frac{R\left[1-(1+i)^n\right]}{i}$

B. $P(1+i)^n$

C. $\frac{R\left[(1+i)^n-1\right]}{i}$

D. $\frac{A}{(1+i)^n}$

D 22. The amount of $2000 invested at 11.25%/a and compounded semiannually for four years is

A. $3063.59

B. $2489.41

C. $2496.88

D. $3098.59

A 23. The present value of an annuity may be expressed as $PV = 50s_{\overline{8}|6\%}$. This means the same as

A. $\dfrac{50\left[1-(1.06)^{-8}\right]}{0.06}$

B. $50(0.06)(8)$

C. $50(1.06)^{8}$

D. $\dfrac{50(1.06)^{8}}{1.06}$

B 24. The period of time when one particular rate is charged for a mortgage is called

A. the life of the mortgage

B. the term of the mortgage

C. the turn-over period

D. the amortization period

D 25. Karen Moorehead obtained a mortgage of \$95 000 at $10\frac{3}{4}\%$/a for thirty years. What will be the total amount of Karen's monthly payments?

A. \$998.02

B. \$937.87

C. \$923.54

D. \$870.20

**Value**

## PART B: WRITTEN RESPONSE

Be sure to show all your work. Part marks will be given for partially correct solutions.

(3) 1. The difference of the squares of two numbers is 47. If one of the numbers is one greater than the other number, what are the two numbers?

Let the first number be $x$ and the second number be $x + 1$.
The equation is obtained from the text.

$$\begin{aligned}(x+1)^2 - x^2 &= 47\\ x^2 + 2x + 1 - x^2 &= 47\\ 2x + 1 &= 47\\ 2x &= 46\\ x &= 23\\ x + 1 &= 24\end{aligned}$$

The two numbers are 23 and 24.

(3) 2. A spray is used to kill certain bugs. The number of bugs killed depends on the length of time the spray is used. The number of bugs is given by

$n = \sqrt{5b + t^2} + 3$, where $n$ is the final number of bugs,
$b$ is the initial number of bugs, and
$t$ is the time (in seconds) of spraying.

If there are 750 insects initially and the spraying goes on for fifteen seconds, how many insects will be left?

$n$ is unknown
$b = 750$
$t = 15$

$$\begin{aligned}n &= \sqrt{5b + t^2} + 3\\ &= \sqrt{5(750) + 15^2} + 3\\ &= \sqrt{3750 + 225} + 3\\ &= \sqrt{3975} + 3\\ &\doteq 63 + 3\\ &\doteq 66\end{aligned}$$

There will be about 66 insects left.

**TEACHER'S COPY**

3. If $f(x)=2x^2+1$ and $g(x)=x-1$, find the following:

(1) a. $g[f(x)]$

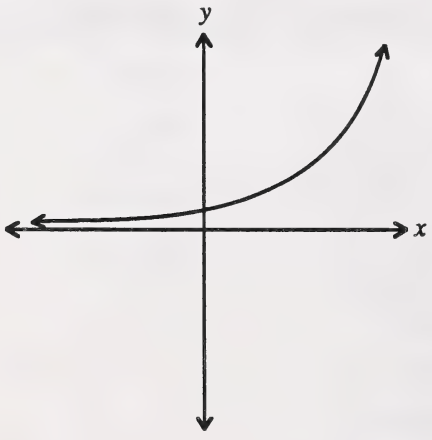
$$\begin{aligned} g[f(x)] &= g\left[2x^2+1\right] \\ &= \left(2x^2+1\right)-1 \\ &= 2x^2 \end{aligned}$$

(1) b. $f[g(x)]$

$$\begin{aligned} f[g(x)] &= f[x-1] \\ &= 2(x-1)^2+1 \\ &= 2\left(x^2-2x+1\right)+1 \\ &= 2x^2-4x+2+1 \\ &= 2x^2-4x+3 \end{aligned}$$

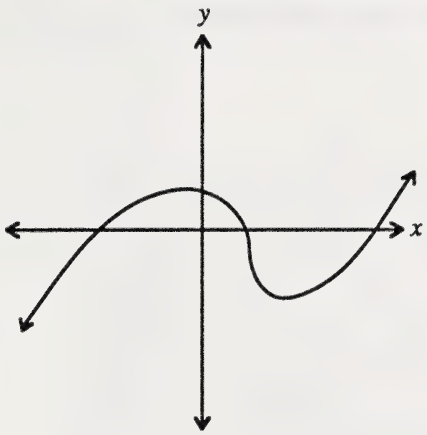
4. Identify the following types of functions.

(1) a.



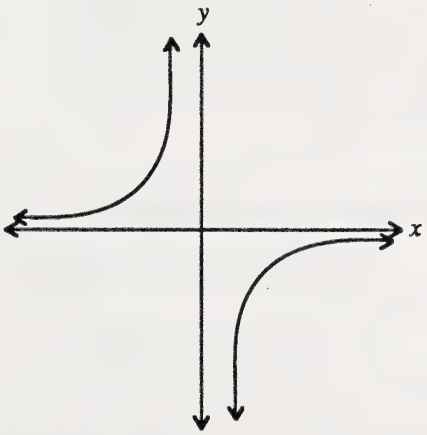

**exponential**

(1) b.




**cubic**

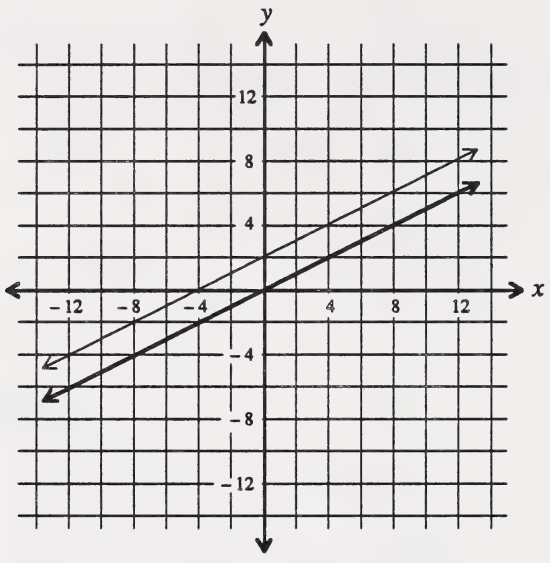
(1) c.



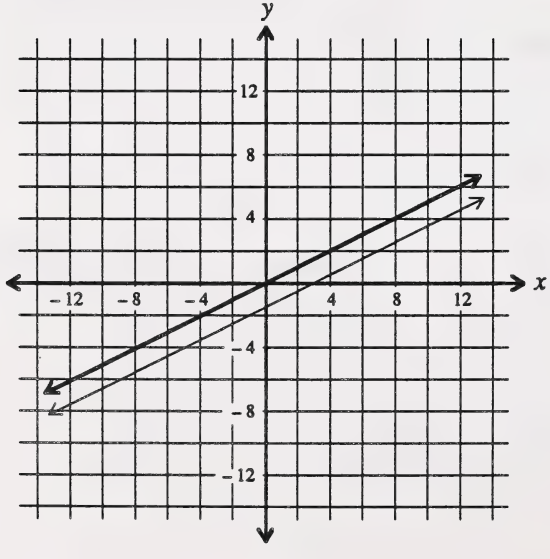

**reciprocal**

5. Sketch the graphs of the following transformations.

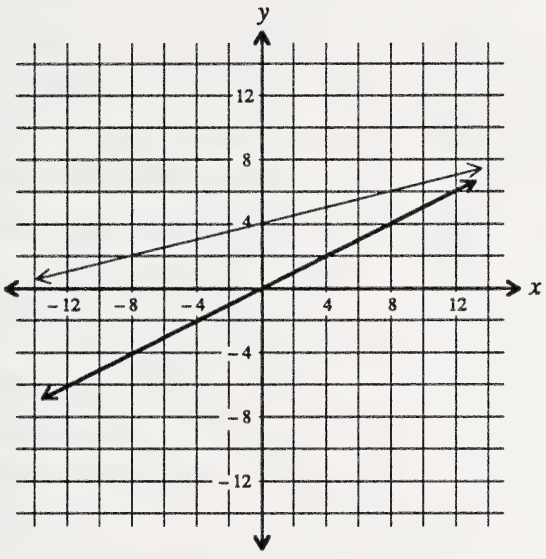
(1) a. $y = f(x) + 2$




(1) b. $y = f(x - 3)$



(1) c. $y=\frac{1}{2}f(x)+4$




6. The area of a rectangle is equal to the length times the width.

(1) a. Write an expression for this function.

Area = length × width or $A = l \times w$

(1) b. Evaluate the expression for the area of a rectangle where the width is 12 cm and the length is 21 cm.

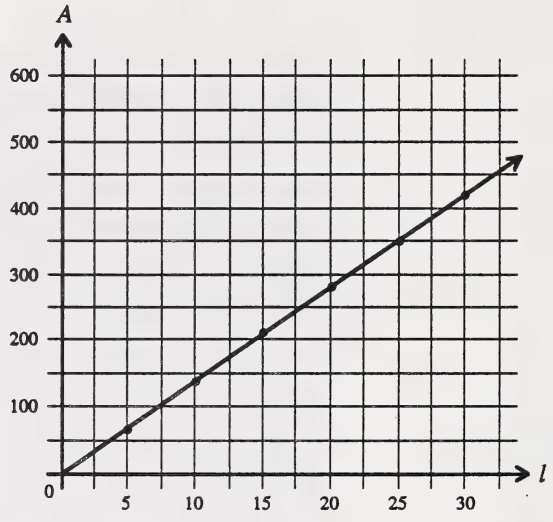
$A = l \times w$

$= 21 \text{ cm} \times 12 \text{ cm}$

$= 252 \text{ cm}^2$

(2) c. Sketch the graph of the function for the area of a rectangle with a constant width of 14 cm.

| $l$ | $A$ |
|---|---|
| 5 | 70 |
| 10 | 140 |
| 15 | 210 |
| 20 | 280 |
| 25 | 350 |
| 30 | 420 |
| 35 | 490 |




(1) d. According to the graph, what area of the rectangle has a length of 29 cm?

From the graph the area will be about 405 square units.

(2) 7. Rewrite the quadratic function $y=5x^2-15x+7$ into the form $y=a(x-h)^2+k$.

$y=5x^2-15x+7$

$y=5\left(x^2-3x\right)+7$

$y=5\left(x^2-3x+(1.5)^2\right)+7-(5)(1.5)^2$

$y=5(x-1.5)^2+7-11.25$

$y=5(x-1.5)^2-4.25$

(5) 8. What is the value of $t$ when $h = 50$ for the function $h = -5t^2 + 75t + 3$?

$$h = -5t^2 + 75t + 3$$
$$50 = -5t^2 + 75t + 3$$
$$0 = -5t^2 + 75t - 47$$

$$0 = -5\left(t^2 - 15t\right) - 47$$
$$0 = -5\left(t^2 - 15t + (7.5)^2\right) - 47 - (-5)(7.5)^2$$
$$0 = -5(t - 7.5)^2 - 47 + 281.25$$
$$0 = -5(t - 7.5)^2 + 234.25$$
$$-234.25 = -5(t - 7.5)^2$$
$$46.85 = (t - 7.5)^2$$
$$\pm\sqrt{46.85} = t - 7.5$$
$$7.5 \pm \sqrt{46.85} = t$$

OR

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$t = \frac{-75 \pm \sqrt{75^2 - 4(-5)(-47)}}{2x - 5}$$
$$t = \frac{-75 \pm \sqrt{5625 - 940}}{-10}$$
$$t = \frac{-75 \pm \sqrt{4685}}{-10}$$
$$t = \frac{-75 \pm 10\sqrt{46.85}}{-10}$$
$$t = 7.5 \pm \sqrt{46.85}$$

9. The trajectory of a football is described by the function $h = -5t^2 + 65t$. Find the following:

(2) a. the maximum height reached by the football

Put the equation $h = -5t^2 + 65t$ into completed square form.

$$h = -5t^2 + 65t$$
$$h = -5\left(t^2 - 13t\right)$$
$$h = -5\left(t^2 - 13t + (6.5)^2\right) - (-5)(6.5)^2$$
$$h = -5(t - 6.5)^2 + 211.25$$

The maximum height reached by the football is 211.25 units.

(1) b. the time required to reach the maximum height

It will take the football 6.5 units of time to reach this height.

(1) c. the total time the football is in the air

The football will be in the air $2 \times 6.5$ units $= 13$ units of time.

(3) 10. State the two roots for the quadratic equation $5x^2+6x=2$.

$$5x^2+6x=2$$

$$5x^2+6x-2=0$$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-b\pm\sqrt{6^2-4(5)(-2)}}{2(5)}$$

$$=\frac{-b\pm\sqrt{36+40}}{10}$$

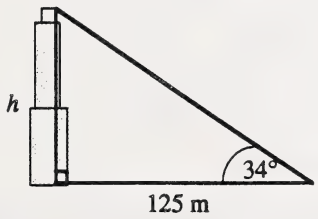
$$=\frac{-b\pm\sqrt{76}}{10}$$

$$=\frac{-6\pm2\sqrt{19}}{10}$$

$$=\frac{\overset{1}{\cancel{2}}\left(-3\pm\sqrt{19}\right)}{\underset{1}{\cancel{2}}(5)}$$

$$=\frac{-3\pm\sqrt{19}}{5}$$

(3) 11. The angle of elevation to the top of a tower from a point $H$ on the ground is 34°. If the distance from point $H$ to the centre of the base of the tower is 125 m, how high is the tower? Round to the nearest metre.




$$\tan 34°=\frac{h}{125\text{ m}}$$

$$h=125\text{ m}\times\tan 34°$$

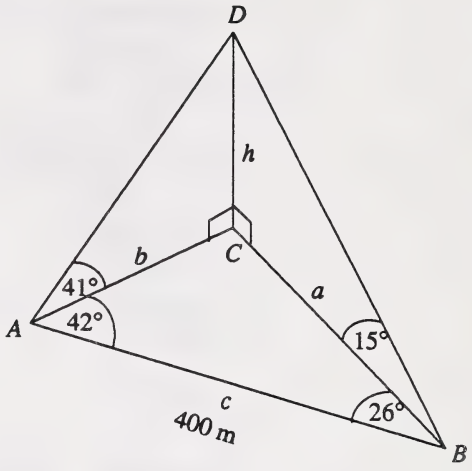
$$h\doteq125\text{ m}\times0.6745$$

$$h\doteq84\text{ m}$$

The tower is about 84 m high.

**TEACHER'S COPY**

(3) 12. A setup for tracking model rockets is shown in the accompanying diagram. The rocket is launched from position $C$ and reaches the height at point $D$. Observers at points $A$ and $B$ measure the angles of elevation. What is the height of the rocket at point $D$?




Step 1: Find angle $C$ using the sum of the angles of a triangle.

$$180° = 42° + 26° + \angle C$$
$$180° = 66° + \angle C$$
$$114° = \angle C$$

Step 2: Find $AC$ using the sine law.

$$\frac{C}{\sin C} = \frac{b}{\sin B}$$
$$\frac{400\text{ m}}{\sin 114°} = \frac{A}{\sin 26°}$$
$$AC = \frac{400\text{ m} \times \sin 26°}{\sin 114°}$$
$$\doteq \frac{400\text{ m} \times 0.4384}{0.9135}$$
$$\doteq 192\text{ m}$$

Step 3: Find $h$ using tangent.

$$\tan 41° = \frac{h}{192\text{ m}}$$
$$h = 192\text{ m} \times \tan 41°$$
$$h \doteq 192\text{ m} \times 0.8693$$
$$h \doteq 167\text{ m}$$

The rocket is about 167 m high when it is at point $D$.

(2) 13. If $\cot\theta = 3.4$, find $\sin\theta$ and $\cos\theta$.

$\cot\theta = 3.4$

$\cot\theta = 3\frac{2}{5}$

$\cot\theta = \frac{15}{5} + \frac{2}{5}$

$\cot\theta = \frac{17}{5}$

$\frac{x}{y} = \frac{17}{5}$

$x = 17$ and $y = 5$

$r^2 = x^2 + y^2$

$= 17^2 + 5^2$

$= 289 + 25$

$= 314$

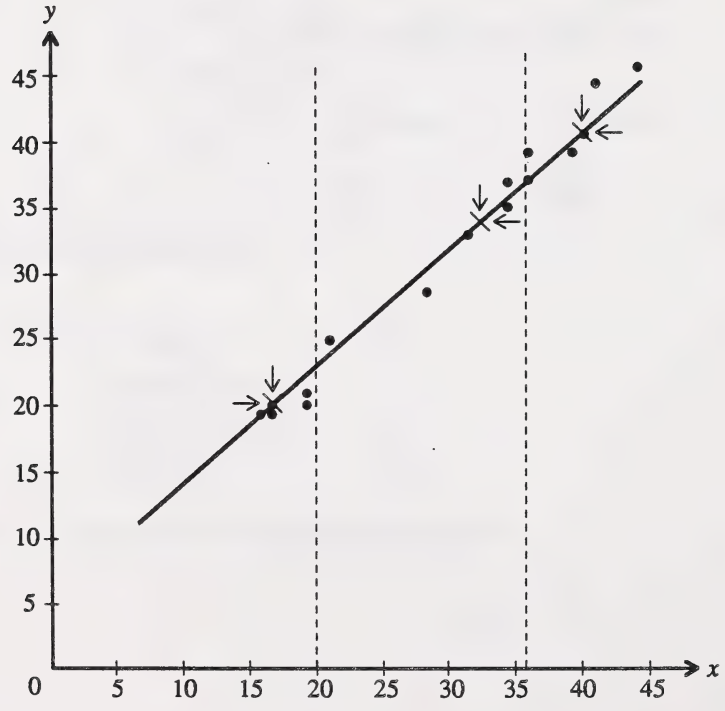
$r \doteq 18$ (to the nearest whole number)

$\sin\theta = \frac{y}{r}$ $\qquad$ $\cos\theta = \frac{x}{r}$

$= \frac{5}{18}$ $\qquad$ $= \frac{17}{18}$

(2) 14. Plot the following bivariate data and the line of best fit.

| $x$ | $y$ |
|---|---|
| 17 | 19 |
| 35 | 37 |
| 17 | 20 |
| 16 | 19 |
| 34 | 35 |
| 19 | 20 |
| 32 | 34 |
| 19 | 22 |
| 38 | 38 |
| 34 | 37 |
| 36 | 38 |
| 28 | 28 |
| 21 | 25 |
| 44 | 46 |
| 41 | 44 |
| 40 | 41 |




**TEACHER'S COPY**

15. Do the following.

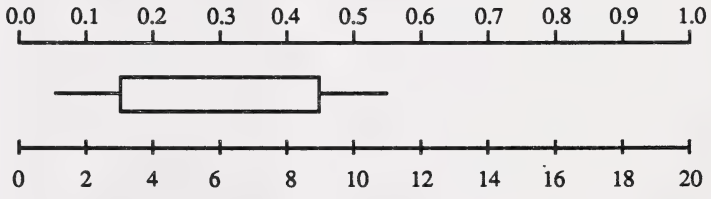
(2) a. Construct a sampling distribution for the following data.

| Sample Number | Results | Number of Yeses |
|---|---|---|
| 1 | NNNNNYNNYNNNYYYNYNNY | 7 |
| 2 | NNNYYNNNYNNYNNNNNNNN | 4 |
| 3 | NNNYNNNYNYNNNNNYNNYNY | 6 |
| 4 | NNNNNYNNYNNYNNYNNYYN | 6 |
| 5 | NNNNYNYNYNYYNNNNNYYN | 7 |
| 6 | NNNNYNNNNYNNNNYNNYNN | 4 |
| 7 | NNNNNYNNNNNYYYNNYNYY | 7 |
| 8 | NNYNYNNNYYNNYNYYYNNN | 8 |
| 9 | YNNNYNNYNNNYYNNNYNNY | 7 |
| 10 | YNNNNNNNYNNNYYYNNNNY | 6 |
| 11 | NNNNNNNYNNNNNYNNNNYN | 3 |
| 12 | YNNYYYYYNNYNYNNNYNNN | 9 |
| 13 | NNYNNYYNNNYYYNNNNNYY | 8 |
| 14 | NNNNYNYNNNNNNYNNNNYN | 4 |
| 15 | NYNNNYNNNNNNYNNYNYYN | 6 |
| 16 | NNNNYNNNNNNNNNNNNNNN | 1 |
| 17 | NYNNYYNYYNNYNNNYNYYN | 9 |
| 18 | NNYNNYNNYNNNNYYNNNYN | 6 |
| 19 | YNNYYNNYNNYYNNNYNNNY | 8 |
| 20 | NNNNNNNNNNNNYNNNYNYN | 3 |
| 21 | NNNNNYNNNNYNNNNNNYNN | 3 |
| 22 | YNNNNYYNNNNYYNNNNNNN | 5 |
| 23 | NNNNYNNNYYYNNNYNNNYY | 7 |
| 24 | NNYYYNNNYYYNNYYNNYNN | 9 |
| 25 | NNNYNNNYNNNNNNYNNNYY | 5 |
| 26 | YYNNNYNNNYNNNNNNNNNN | 4 |
| 27 | YNYNNNNYNNNYNYNNNNYNY | 7 |
| 28 | YNNNYYNYNYNNYNNNYNNY | 8 |
| 29 | YNYNNNNYYNNYYNYYNNNN | 8 |
| 30 | NNYNNNNYYNNYNNYNNNYY | 7 |
| 31 | NNNNNNNYNNNNNNNYNNNN | 2 |
| 32 | YNYYNNYNNNNNNYYYYNNY | 9 |
| 33 | NYNNNYNNNNNNNYNNNNNN | 3 |
| 34 | YNYNNYYNNNNNYNYYNYNY | 9 |
| 35 | YNNNNNYNNNYNYNYYNNNY | 7 |
| 36 | YNNYYNNYNYNYYNNNNYNN | 8 |
| 37 | NYNNNYNYNNYNNYYNYNNN | 7 |
| 38 | NNNNNNYNNNYNNNYYYYNN | 6 |
| 39 | YYYNNNNNNNNYYYNNNNYY | 9 |
| 40 | NNNYNNNYYNNNNNYNNYNY | 6 |
| 41 | NYYYNNNNNNNNYNNNNNYY | 6 |
| 42 | YYYYYNNNYNNNYNYNNYYN | 10 |
| 43 | YYNYNNNNNYNNNYNNYNYN | 7 |
| 44 | NNNNNYNNNNNNYNYNYNNN | 4 |
| 45 | NNNYYYYNNYYNYNYNYNNN | 9 |
| 46 | NNYYYYNNYNYNYNYNYNYY | 11 |
| 47 | NNNNYNNNYNYNNNNNNYYN | 5 |
| 48 | NNNNYYYNNNYNNNNYNNNY | 6 |
| 49 | NYYNNNYNNNNNNYNYNYYN | 7 |
| 50 | NYNNYNNYNNNYNNNYNYNY | 7 |

**TEACHER'S COPY**

| Number of Yeses | Sample Proportion | Frequency | Proportion of all Trials |
|---|---|---|---|
| 0 | 0.00 | 0 | 0.00 |
| 1 | 0.05 | 1 | 0.02 |
| 2 | 0.10 | 1 | 0.02 |
| 3 | 0.15 | 4 | 0.08 |
| 4 | 0.20 | 5 | 0.10 |
| 5 | 0.25 | 3 | 0.06 |
| 6 | 0.30 | 9 | 0.18 |
| 7 | 0.35 | 12 | 0.24 |
| 8 | 0.40 | 6 | 0.12 |
| 9 | 0.45 | 7 | 0.02 |
| 10 | 0.50 | 1 | 0.02 |
| 11 | 0.55 | 1 | 0.00 |
| 12 | 0.60 | 0 | 0.00 |
| 13 | 0.65 | 0 | 0.00 |
| 14 | 0.70 | 0 | 0.00 |
| 15 | 0.75 | 0 | 0.00 |
| 16 | 0.80 | 0 | 0.00 |
| 17 | 0.85 | 0 | 0.00 |
| 18 | 0.90 | 0 | 0.00 |
| 19 | 0.95 | 0 | 0.00 |
| 20 | 1.00 | 0 | 0.00 |

(2) b. Construct the box and whisker plot for the sampling distribution.




**TEACHER'S COPY**

③ 16. Joan Horn paid off a three-year loan using nonblended payments. What was the total amount that Joan returned to the bank if she paid off \$250 of the principal each month and the bank charged $10\frac{1}{2}\%$/a for the loan? Round to the nearest cent.

This is the same situation as finding the amount of an annuity where \$250 is being deposited each month and is earning $10\frac{1}{2}\%$/a compounded monthly.

$$A = \frac{P\left[(1+i)^n - 1\right]}{i}$$

$$= \frac{\$250\left[(1+0.008\,75)^{36} - 1\right]}{0.008\,75}$$

$$\doteq \frac{\$250(0.368\,383\,151)}{0.008\,75}$$

$$\doteq \$10\,525.23$$

Joan will return about \$10 525.23 to the bank.

## Monthly Payments Including Principal and Interest for a Mortgage of $1000

| YEARS | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
|---|---|---|---|---|---|---|---|
| RATE (%) | | | | | | | |
| 8 | 20.21 | 12.06 | 9.48 | 8.28 | 7.63 | 7.25 | 7.01 |
| 8 1/4 | 20.33 | 12.19 | 9.62 | 8.43 | 7.79 | 7.42 | 7.18 |
| 8 1/2 | 20.45 | 12.32 | 9.76 | 8.59 | 7.96 | 7.59 | 7.37 |
| 8 3/4 | 20.56 | 12.45 | 9.90 | 8.74 | 8.12 | 7.76 | 7.54 |
| 9 | 20.69 | 12.58 | 10.05 | 8.89 | 8.28 | 7.93 | 7.72 |
| 9 1/4 | 20.80 | 12.71 | 10.19 | 9.05 | 8.44 | 8.10 | 7.90 |
| 9 1/2 | 20.91 | 12.84 | 10.33 | 9.20 | 8.61 | 8.28 | 8.08 |
| 9 3/4 | 21.03 | 12.97 | 10.48 | 9.36 | 8.78 | 8.45 | 8.26 |
| 10 | 21.15 | 13.10 | 10.62 | 9.52 | 8.94 | 8.63 | 8.44 |
| 10 1/4 | 21.27 | 13.24 | 10.77 | 9.68 | 9.11 | 8.80 | 8.63 |
| 10 1/2 | 21.38 | 13.37 | 10.92 | 9.83 | 9.28 | 8.98 | 8.81 |
| 10 3/4 | 21.50 | 13.50 | 11.06 | 10.00 | 9.45 | 9.16 | 8.99 |
| 11 | 21.62 | 13.64 | 11.21 | 10.16 | 9.63 | 9.34 | 9.18 |
| 11 1/4 | 21.74 | 13.77 | 11.36 | 10.32 | 9.80 | 9.52 | 9.37 |
| 11 1/2 | 21.86 | 13.91 | 11.51 | 10.48 | 9.97 | 9.70 | 9.55 |
| 11 3/4 | 21.98 | 14.04 | 11.66 | 10.65 | 10.14 | 9.88 | 9.74 |
| 12 | 22.10 | 14.18 | 11.82 | 10.81 | 10.32 | 10.06 | 9.93 |
| 12 1/4 | 22.22 | 14.32 | 11.97 | 10.98 | 10.50 | 10.25 | 10.12 |
| 12 1/2 | 22.34 | 14.46 | 12.13 | 11.15 | 10.68 | 10.43 | 10.31 |
| 12 3/4 | 22.46 | 14.60 | 12.28 | 11.31 | 10.85 | 10.62 | 10.50 |
| 13 | 22.59 | 14.74 | 12.44 | 11.48 | 11.03 | 10.97 | 10.69 |
| 13 1/4 | 22.71 | 14.88 | 12.59 | 11.65 | 11.21 | 10.99 | 10.88 |
| 13 1/2 | 22.83 | 15.02 | 12.75 | 11.82 | 11.38 | 11.17 | 11.07 |
| 13 3/4 | 22.95 | 15.16 | 12.90 | 11.99 | 11.56 | 11.36 | 11.26 |
| 14 | 23.07 | 15.30 | 13.06 | 12.16 | 11.74 | 11.54 | 11.45 |
| 14 1/4 | 23.19 | 15.44 | 13.22 | 12.33 | 11.92 | 11.73 | 11.64 |
| 14 1/2 | 23.31 | 15.58 | 13.38 | 12.50 | 12.10 | 11.92 | 11.83 |
| 14 3/4 | 23.44 | 15.72 | 13.54 | 12.67 | 12.29 | 12.10 | 12.02 |
| 15 | 23.56 | 15.87 | 13.70 | 12.84 | 12.47 | 12.29 | 12.21 |
| 15 1/4 | 23.68 | 16.01 | 13.86 | 13.02 | 12.65 | 12.48 | 12.40 |
| 15 1/2 | 23.81 | 16.15 | 14.02 | 13.19 | 12.83 | 12.67 | 12.59 |
| 15 3/4 | 23.93 | 16.30 | 14.18 | 13.36 | 13.01 | 12.86 | 12.78 |
| 16 | 24.05 | 16.44 | 14.34 | 13.54 | 13.20 | 13.04 | 12.97 |
| 16 1/4 | 24.18 | 16.59 | 14.50 | 13.71 | 13.38 | 13.23 | 13.17 |
| 16 1/2 | 24.30 | 16.73 | 14.66 | 13.89 | 13.56 | 13.42 | 13.36 |
| 16 3/4 | 24.43 | 16.88 | 14.83 | 14.06 | 13.75 | 13.61 | 13.55 |
| 17 | 24.55 | 17.02 | 14.99 | 14.24 | 13.93 | 13.80 | 13.74 |
| 17 1/4 | 24.68 | 17.17 | 15.16 | 14.42 | 14.11 | 13.99 | 13.93 |
| 17 1/2 | 24.80 | 17.32 | 15.32 | 14.59 | 14.30 | 14.18 | 14.12 |
| 17 3/4 | 24.93 | 17.47 | 15.49 | 14.77 | 14.48 | 14.36 | 14.31 |
| 18 | 25.05 | 17.61 | 15.65 | 14.95 | 14.67 | 14.55 | 14.51 |
| 18 1/4 | 25.18 | 17.76 | 15.82 | 15.13 | 14.85 | 14.74 | 14.70 |
| 18 1/2 | 25.30 | 17.91 | 15.98 | 15.30 | 15.04 | 14.93 | 14.89 |
| 18 3/4 | 25.43 | 18.06 | 16.15 | 15.48 | 15.23 | 15.12 | 15.08 |
| 19 | 25.56 | 18.21 | 16.32 | 15.66 | 15.41 | 15.31 | 15.27 |
| 19 1/4 | 25.68 | 18.36 | 16.49 | 15.84 | 15.60 | 15.50 | 15.46 |
| 19 1/2 | 25.81 | 18.51 | 16.65 | 16.02 | 15.78 | 15.69 | 15.65 |
| 19 3/4 | 25.94 | 18.66 | 16.82 | 16.20 | 15.97 | 15.88 | 15.85 |
| 20 | 26.06 | 18.81 | 16.99 | 16.38 | 16.15 | 16.07 | 16.04 |

# AMOUNT OF AN ANNUITY

$$S_{\overline{n}|i} = \frac{(1+i)^n - 1}{i}$$

| $n$ | ½% | 1% | 1½% | 2% | 2½% | 3% | 3½% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1 |
| 2 | 2.00500 | 2.01000 | 2.01500 | 2.02000 | 2.02500 | 2.03000 | 2.03500 | 2 |
| 3 | 3.01503 | 3.03010 | 3.04523 | 3.06040 | 3.07563 | 3.09090 | 3.10623 | 3 |
| 4 | 4.03010 | 4.06040 | 4.09090 | 4.12161 | 4.15252 | 4.18363 | 4.21494 | 4 |
| 5 | 5.05025 | 5.10101 | 5.15227 | 5.20404 | 5.25633 | 5.30914 | 5.36247 | 5 |
| 6 | 6.07550 | 6.15202 | 6.22955 | 6.30812 | 6.38774 | 6.46841 | 6.55015 | 6 |
| 7 | 7.10588 | 7.21354 | 7.32299 | 7.43428 | 7.54743 | 7.66246 | 7.77948 | 7 |
| 8 | 8.14141 | 8.28567 | 8.43284 | 8.58297 | 8.73612 | 8.89237 | 9.05169 | 8 |
| 9 | 9.18212 | 9.36853 | 9.55933 | 9.75463 | 9.95452 | 10.15911 | 10.36850 | 9 |
| 10 | 10.22803 | 10.46221 | 10.70272 | 10.94972 | 11.20338 | 11.46388 | 11.73139 | 10 |
| 11 | 11.27917 | 11.56683 | 11.86326 | 12.16872 | 12.48347 | 12.80780 | 13.14199 | 11 |
| 12 | 12.33556 | 12.68250 | 13.04121 | 13.41209 | 13.79555 | 14.19203 | 14.60196 | 12 |
| 13 | 13.39724 | 13.80933 | 14.23683 | 14.68033 | 15.14044 | 15.61779 | 16.11303 | 13 |
| 14 | 14.46423 | 14.94742 | 15.45038 | 15.97394 | 16.51895 | 17.08632 | 17.67698 | 14 |
| 15 | 15.53655 | 16.09690 | 16.68214 | 17.29342 | 17.93193 | 18.59891 | 19.29568 | 15 |
| 16 | 16.61423 | 17.25786 | 17.93237 | 18.63929 | 19.38022 | 20.15688 | 20.97103 | 16 |
| 17 | 17.69730 | 18.43044 | 19.20136 | 20.01207 | 20.86473 | 21.76159 | 22.70502 | 17 |
| 18 | 18.78579 | 19.61475 | 20.48938 | 21.41231 | 22.38635 | 23.41444 | 24.49969 | 18 |
| 19 | 19.87972 | 20.81090 | 21.79672 | 22.84056 | 23.94601 | 25.11687 | 26.35718 | 19 |
| 20 | 20.97912 | 22.01900 | 23.12367 | 24.29737 | 25.54466 | 26.87037 | 28.27968 | 20 |
| 21 | 22.08401 | 23.23919 | 24.47052 | 25.78332 | 27.18327 | 28.67649 | 30.26947 | 21 |
| 22 | 23.19443 | 24.47159 | 25.83758 | 27.29898 | 28.86286 | 30.53678 | 32.32890 | 22 |
| 23 | 24.31040 | 25.71630 | 27.22514 | 28.84496 | 30.58443 | 32.45288 | 34.46041 | 23 |
| 24 | 25.43196 | 26.97346 | 28.63352 | 30.42186 | 32.34904 | 34.42647 | 36.66653 | 24 |
| 25 | 26.55912 | 28.24320 | 30.06302 | 32.03030 | 34.15776 | 36.45926 | 38.94986 | 25 |
| 26 | 27.69191 | 29.52563 | 31.51397 | 33.67091 | 36.01171 | 38.55304 | 41.31310 | 26 |
| 27 | 28.83037 | 30.82089 | 32.98668 | 35.34432 | 37.91200 | 40.70963 | 43.75906 | 27 |
| 28 | 29.97452 | 32.12910 | 34.48148 | 37.05121 | 39.85980 | 42.93092 | 46.29063 | 28 |
| 29 | 31.12439 | 33.45039 | 35.99870 | 38.79223 | 41.85630 | 45.21885 | 48.91080 | 29 |
| 30 | 32.28002 | 34.78489 | 37.53868 | 40.56808 | 43.90270 | 47.57546 | 51.62268 | 30 |
| 31 | 33.44142 | 36.13274 | 39.10176 | 42.37944 | 46.00027 | 50.00268 | 54.42947 | 31 |
| 32 | 34.60862 | 37.49408 | 40.68829 | 44.22703 | 48.15028 | 52.50276 | 57.33450 | 32 |
| 33 | 35.78167 | 38.86901 | 42.29861 | 46.11157 | 50.35403 | 55.07784 | 60.34121 | 33 |
| 34 | 36.96058 | 40.25770 | 43.93309 | 48.03380 | 52.61289 | 57.73018 | 63.45315 | 34 |
| 35 | 38.14538 | 41.66028 | 45.59209 | 49.99448 | 54.92821 | 60.46208 | 66.67401 | 35 |
| 36 | 39.33611 | 43.07688 | 47.27597 | 51.99437 | 57.30141 | 63.27594 | 70.00760 | 36 |
| 37 | 40.53279 | 44.50765 | 48.98511 | 54.03425 | 59.73395 | 66.17422 | 73.45787 | 37 |
| 38 | 41.73545 | 45.95272 | 50.71989 | 56.11494 | 62.22730 | 69.15945 | 77.02889 | 38 |
| 39 | 42.94413 | 47.41225 | 52.48068 | 58.23724 | 64.78298 | 72.23423 | 80.72491 | 39 |
| 40 | 44.15885 | 48.88637 | 54.26789 | 60.40198 | 67.40255 | 75.40126 | 84.55028 | 40 |
| 41 | 45.37964 | 50.37524 | 56.08191 | 62.61002 | 70.08762 | 78.66330 | 88.50954 | 41 |
| 42 | 46.60654 | 51.87899 | 57.92314 | 64.86222 | 72.83981 | 82.02320 | 92.60737 | 42 |
| 43 | 47.83957 | 53.39778 | 59.79199 | 67.15947 | 75.66080 | 85.48389 | 96.84863 | 43 |
| 44 | 49.07877 | 54.93176 | 61.68887 | 69.50266 | 78.55232 | 89.04841 | 101.23831 | 44 |
| 45 | 50.32416 | 56.48107 | 63.61420 | 71.89271 | 81.51613 | 92.71986 | 105.78162 | 45 |
| 46 | 51.57579 | 58.04589 | 65.56841 | 74.33056 | 84.55403 | 96.50146 | 110.48403 | 46 |
| 47 | 52.83366 | 59.62634 | 67.55194 | 76.81718 | 87.66789 | 100.39650 | 115.35097 | 47 |
| 48 | 54.09783 | 61.22261 | 69.56522 | 79.35352 | 90.85958 | 104.40840 | 120.38826 | 48 |
| 49 | 55.36832 | 62.83483 | 71.60870 | 81.94059 | 94.13107 | 108.54065 | 125.60185 | 49 |
| 50 | 56.64516 | 64.46318 | 73.68283 | 84.57940 | 97.48435 | 112.79687 | 130.99791 | 50 |
| $n$ | ½% | 1% | 1½% | 2% | 2½% | 3% | 3½% | $n$ |

**TEACHER'S COPY**

# AMOUNT OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{(1+i)^n - 1}{i}$$

| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1 |
| 2 | 2.04000 | 2.05000 | 2.06000 | 2.07000 | 2.08000 | 2.09000 | 2.10000 | 2 |
| 3 | 3.12160 | 3.15250 | 3.18360 | 3.21490 | 3.24640 | 3.27810 | 3.31000 | 3 |
| 4 | 4.24646 | 4.31013 | 4.37462 | 4.43994 | 4.50611 | 4.57313 | 4.64100 | 4 |
| 5 | 5.41632 | 5.52563 | 5.63709 | 5.75074 | 5.86660 | 5.98471 | 6.10510 | 5 |
| 6 | 6.63298 | 6.80191 | 6.97532 | 7.15329 | 7.33593 | 7.52333 | 7.71561 | 6 |
| 7 | 7.89829 | 8.14201 | 8.39384 | 8.65402 | 8.92280 | 9.20043 | 9.48717 | 7 |
| 8 | 9.21423 | 9.54911 | 9.89747 | 10.25980 | 10.63663 | 11.02847 | 11.43589 | 8 |
| 9 | 10.58280 | 11.02656 | 11.49132 | 11.97799 | 12.48756 | 13.02104 | 13.57948 | 9 |
| 10 | 12.00611 | 12.57789 | 13.18079 | 13.81645 | 14.48656 | 15.19293 | 15.93742 | 10 |
| 11 | 13.48635 | 14.20679 | 14.97164 | 15.78360 | 16.64549 | 17.56029 | 18.53117 | 11 |
| 12 | 15.02581 | 15.91713 | 16.86994 | 17.88845 | 18.97713 | 20.14072 | 21.38428 | 12 |
| 13 | 16.62684 | 17.71298 | 18.88214 | 20.14064 | 21.49530 | 22.95338 | 24.52271 | 13 |
| 14 | 18.29191 | 19.59863 | 21.01507 | 22.55049 | 24.21492 | 26.01919 | 27.97498 | 14 |
| 15 | 20.02359 | 21.57856 | 23.27597 | 25.12902 | 27.15211 | 29.36092 | 31.77248 | 15 |
| 16 | 21.82453 | 23.65749 | 25.67253 | 27.88805 | 30.32428 | 33.00330 | 35.94973 | 16 |
| 17 | 23.69751 | 25.84037 | 28.21288 | 30.84022 | 33.75023 | 36.97370 | 40.54470 | 17 |
| 18 | 25.64541 | 28.13238 | 30.90565 | 33.99903 | 37.45024 | 41.30134 | 45.59917 | 18 |
| 19 | 27.67123 | 30.53900 | 33.75999 | 37.37896 | 41.44626 | 46.01846 | 51.15909 | 19 |
| 20 | 29.77808 | 33.06595 | 36.78559 | 40.99549 | 45.76196 | 51.16012 | 57.27500 | 20 |
| 21 | 31.96920 | 35.71925 | 39.99273 | 44.86518 | 50.42292 | 56.76453 | 64.00250 | 21 |
| 22 | 34.24797 | 38.50521 | 43.39229 | 49.00574 | 55.45676 | 62.87334 | 71.40275 | 22 |
| 23 | 36.61789 | 41.43048 | 46.99583 | 53.43614 | 60.89330 | 69.53194 | 79.54302 | 23 |
| 24 | 39.08260 | 44.50200 | 50.81558 | 58.17667 | 66.76476 | 76.78981 | 88.49733 | 24 |
| 25 | 41.64591 | 47.72710 | 54.86451 | 63.24904 | 73.10594 | 84.70090 | 98.34706 | 25 |
| 26 | 44.31174 | 51.11345 | 59.15638 | 68.67647 | 79.95442 | 93.32398 | 109.18177 | 26 |
| 27 | 47.08421 | 54.66913 | 63.70577 | 74.48382 | 87.35077 | 102.72313 | 121.09994 | 27 |
| 28 | 49.96758 | 58.40258 | 68.52811 | 80.69769 | 95.33883 | 112.96822 | 134.20994 | 28 |
| 29 | 52.96629 | 62.32271 | 73.63980 | 87.34653 | 103.96594 | 124.13536 | 148.63093 | 29 |
| 30 | 56.08494 | 66.43885 | 79.05819 | 94.46079 | 113.28321 | 136.30754 | 164.49402 | 30 |
| 31 | 59.32834 | 70.76079 | 84.80168 | 102.07304 | 123.34587 | 149.57522 | 181.94342 | 31 |
| 32 | 62.70147 | 75.29883 | 90.88978 | 110.21815 | 134.21354 | 164.03699 | 201.13777 | 32 |
| 33 | 66.20953 | 80.06377 | 97.34316 | 118.93343 | 145.95062 | 179.80032 | 222.25154 | 33 |
| 34 | 69.85791 | 85.06697 | 104.18375 | 128.25876 | 158.62667 | 196.98234 | 245.47670 | 34 |
| 35 | 73.65222 | 90.32031 | 111.43478 | 138.23688 | 172.31680 | 215.71075 | 271.02437 | 35 |
| 36 | 77.59831 | 95.83632 | 119.12087 | 148.91346 | 187.10215 | 236.12472 | 299.12681 | 36 |
| 37 | 81.70225 | 101.62814 | 127.26812 | 160.33740 | 203.07032 | 258.37595 | 330.03949 | 37 |
| 38 | 85.97034 | 107.70955 | 135.90421 | 172.56102 | 220.31595 | 282.62978 | 364.04343 | 38 |
| 39 | 90.40915 | 114.09502 | 145.05846 | 185.64029 | 238.94122 | 309.06646 | 401.44778 | 39 |
| 40 | 95.02552 | 120.79977 | 154.76197 | 199.63511 | 259.05652 | 337.88245 | 442.59256 | 40 |
| 41 | 99.82654 | 127.83976 | 165.04768 | 214.60957 | 280.78104 | 369.29187 | 487.85181 | 41 |
| 42 | 104.81960 | 135.23175 | 175.95054 | 230.63224 | 304.24352 | 403.52813 | 537.63699 | 42 |
| 43 | 110.01238 | 142.99337 | 187.50758 | 247.77650 | 329.58301 | 440.84566 | 592.40069 | 43 |
| 44 | 115.41288 | 151.14301 | 199.75803 | 266.12085 | 356.94965 | 481.52177 | 652.64076 | 44 |
| 45 | 121.02939 | 159.70016 | 212.74351 | 285.74931 | 386.50562 | 525.85873 | 718.90484 | 45 |
| 46 | 126.87057 | 168.68516 | 226.50812 | 306.75176 | 418.42607 | 574.18602 | 791.79532 | 46 |
| 47 | 132.94539 | 178.11942 | 241.09861 | 329.22439 | 452.90015 | 626.86276 | 871.97485 | 47 |
| 48 | 139.26321 | 188.02539 | 256.56453 | 353.27009 | 490.13216 | 684.28041 | 960.17234 | 48 |
| 49 | 145.83373 | 198.42666 | 272.95840 | 378.99900 | 530.34274 | 746.86565 | 1057.18957 | 49 |
| 50 | 152.66708 | 209.34800 | 290.33590 | 406.52893 | 573.77016 | 815.08356 | 1163.90853 | 50 |
| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |

**TEACHER'S COPY**

# PRESENT VALUE OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{1-(1+i)^{-n}}{i}$$

| $n$ | $\frac{1}{2}\%$ | $1\%$ | $1\frac{1}{2}\%$ | $2\%$ | $2\frac{1}{2}\%$ | $3\%$ | $3\frac{1}{2}\%$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.99502 | 0.99010 | 0.98522 | 0.98039 | 0.97561 | 0.97087 | 0.96618 | 1 |
| 2 | 1.98510 | 1.97046 | 1.95588 | 1.94156 | 1.92742 | 1.91347 | 1.89969 | 2 |
| 3 | 2.97025 | 2.94099 | 2.91220 | 2.88388 | 2.85602 | 2.82861 | 2.80164 | 3 |
| 4 | 3.95050 | 3.90197 | 3.85438 | 3.80773 | 3.76197 | 3.71710 | 3.67308 | 4 |
| 5 | 4.92587 | 4.85343 | 4.78265 | 4.71346 | 4.64583 | 4.57971 | 4.51505 | 5 |
| 6 | 5.89638 | 5.79548 | 5.69719 | 5.60143 | 5.50813 | 5.41719 | 5.32855 | 6 |
| 7 | 6.86207 | 6.72819 | 6.59821 | 6.47199 | 6.34939 | 6.23028 | 6.11454 | 7 |
| 8 | 7.82296 | 7.65168 | 7.48593 | 7.32548 | 7.17014 | 7.01969 | 6.87396 | 8 |
| 9 | 8.77906 | 8.56602 | 8.36052 | 8.16224 | 7.97087 | 7.78611 | 7.60769 | 9 |
| 10 | 9.73041 | 9.47130 | 9.22218 | 8.98259 | 8.75206 | 8.53020 | 8.31661 | 10 |
| 11 | 10.67703 | 10.36763 | 10.07112 | 9.78685 | 9.51420 | 9.25266 | 9.00155 | 11 |
| 12 | 11.61893 | 11.25508 | 10.90751 | 10.57534 | 10.25776 | 9.95400 | 9.66333 | 12 |
| 13 | 12.55615 | 12.13374 | 11.73153 | 11.34837 | 10.98318 | 10.63496 | 10.30274 | 13 |
| 14 | 13.48871 | 13.00370 | 12.54338 | 12.10625 | 11.69091 | 11.29607 | 10.92052 | 14 |
| 15 | 14.41662 | 13.86505 | 13.34323 | 12.84926 | 12.38138 | 11.93794 | 11.51741 | 15 |
| 16 | 15.33993 | 14.71787 | 14.13126 | 13.57771 | 13.05500 | 12.56110 | 12.09412 | 16 |
| 17 | 16.25863 | 15.56225 | 14.90765 | 14.29187 | 13.71220 | 13.16612 | 12.65132 | 17 |
| 18 | 17.17277 | 16.39827 | 15.67256 | 14.99203 | 14.35336 | 13.75351 | 13.18968 | 18 |
| 19 | 18.08236 | 17.22601 | 16.42617 | 15.67846 | 14.97889 | 14.32380 | 13.70984 | 19 |
| 20 | 18.98742 | 18.04555 | 17.16864 | 16.35143 | 15.58916 | 14.87747 | 14.21240 | 20 |
| 21 | 19.88798 | 18.85698 | 17.90014 | 17.01121 | 16.18455 | 15.41502 | 14.69797 | 21 |
| 22 | 20.78406 | 19.66038 | 18.62082 | 17.65805 | 16.76541 | 15.93692 | 15.16712 | 22 |
| 23 | 21.67568 | 20.45582 | 19.33086 | 18.29220 | 17.33211 | 16.44361 | 15.62041 | 23 |
| 24 | 22.56287 | 21.24339 | 20.03041 | 18.91393 | 17.88499 | 16.93554 | 16.05837 | 24 |
| 25 | 23.44564 | 22.02316 | 20.71961 | 19.52346 | 18.42438 | 17.41315 | 16.48151 | 25 |
| 26 | 24.32402 | 22.79520 | 21.39863 | 20.12104 | 18.95061 | 17.87684 | 16.89035 | 26 |
| 27 | 25.19803 | 23.55961 | 22.06762 | 20.70690 | 19.46401 | 18.32703 | 17.28536 | 27 |
| 28 | 26.06769 | 24.31644 | 22.72672 | 21.28127 | 19.96489 | 18.76411 | 17.66702 | 28 |
| 29 | 26.93302 | 25.06579 | 23.37608 | 21.84438 | 20.45350 | 19.18845 | 18.03577 | 29 |
| 30 | 27.79405 | 25.80771 | 24.01584 | 22.39646 | 20.93023 | 19.60044 | 18.39205 | 30 |
| 31 | 28.65080 | 26.54229 | 24.64615 | 22.93770 | 21.39540 | 20.00043 | 18.73628 | 31 |
| 32 | 29.50328 | 27.26959 | 25.26714 | 23.46834 | 21.84918 | 20.38877 | 19.06887 | 32 |
| 33 | 30.35153 | 27.98969 | 25.87895 | 23.98856 | 22.29181 | 20.76579 | 19.39021 | 33 |
| 34 | 31.19555 | 28.70267 | 26.48173 | 24.49859 | 22.72379 | 21.13184 | 19.70068 | 34 |
| 35 | 32.03537 | 29.40858 | 27.07559 | 24.99862 | 23.14516 | 21.48722 | 20.00066 | 35 |
| 36 | 32.87102 | 30.10751 | 27.66068 | 25.48884 | 23.55625 | 21.83225 | 20.29049 | 36 |
| 37 | 33.70250 | 30.79951 | 28.23713 | 25.96945 | 23.95732 | 22.16724 | 20.57053 | 37 |
| 38 | 34.52985 | 31.48466 | 28.80505 | 26.44064 | 24.34860 | 22.49246 | 20.84109 | 38 |
| 39 | 35.35309 | 32.16303 | 29.36458 | 26.90259 | 24.73034 | 22.80822 | 21.10250 | 39 |
| 40 | 36.17223 | 32.83469 | 29.91585 | 27.35548 | 25.10278 | 23.11477 | 21.35507 | 40 |
| 41 | 36.98729 | 33.49969 | 30.45896 | 27.79949 | 25.46612 | 23.41240 | 21.59910 | 41 |
| 42 | 37.79800 | 34.15811 | 30.99405 | 28.23479 | 25.82061 | 23.70136 | 21.83488 | 42 |
| 43 | 38.60527 | 34.81001 | 31.52123 | 28.66156 | 26.16645 | 23.98190 | 22.06269 | 43 |
| 44 | 39.40823 | 35.45545 | 32.04062 | 29.07996 | 26.50385 | 24.25427 | 22.28279 | 44 |
| 45 | 40.20720 | 36.09451 | 32.55234 | 29.49016 | 26.83302 | 24.51871 | 22.49545 | 45 |
| 46 | 41.00219 | 36.72724 | 33.05649 | 29.89231 | 27.15417 | 24.77545 | 22.70092 | 46 |
| 47 | 41.79322 | 37.35370 | 33.55319 | 30.28658 | 27.46748 | 25.02471 | 22.89944 | 47 |
| 48 | 42.58032 | 37.97396 | 34.04255 | 30.67312 | 27.77315 | 25.26671 | 23.09124 | 48 |
| 49 | 43.36350 | 38.58808 | 34.52468 | 31.05208 | 28.07137 | 25.50166 | 23.27656 | 49 |
| 50 | 44.14279 | 39.19612 | 34.99969 | 31.42361 | 28.36231 | 25.72976 | 23.45562 | 50 |
| $n$ | $\frac{1}{2}\%$ | $1\%$ | $1\frac{1}{2}\%$ | $2\%$ | $2\frac{1}{2}\%$ | $3\%$ | $3\frac{1}{2}\%$ | $n$ |

**TEACHER'S COPY**

# PRESENT VALUE OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{1-(1+i)^{-n}}{i}$$

| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.96154 | 0.95238 | 0.94340 | 0.93458 | 0.92593 | 0.91743 | 0.90909 | 1 |
| 2 | 1.88609 | 1.85941 | 1.83339 | 1.80802 | 1.78326 | 1.75911 | 1.73554 | 2 |
| 3 | 2.77509 | 2.72325 | 2.67301 | 2.62432 | 2.57710 | 2.53129 | 2.48685 | 3 |
| 4 | 3.62990 | 3.54595 | 3.46511 | 3.38721 | 3.31213 | 3.23972 | 3.16987 | 4 |
| 5 | 4.45182 | 4.32948 | 4.21236 | 4.10020 | 3.99271 | 3.88965 | 3.79079 | 5 |
| 6 | 5.24214 | 5.07569 | 4.91732 | 4.76654 | 4.62288 | 4.48592 | 4.35526 | 6 |
| 7 | 6.00205 | 5.78637 | 5.58238 | 5.38929 | 5.20637 | 5.03295 | 4.86842 | 7 |
| 8 | 6.73274 | 6.46321 | 6.20979 | 5.97130 | 5.74664 | 5.53482 | 5.33493 | 8 |
| 9 | 7.43533 | 7.10782 | 6.80169 | 6.51523 | 6.24689 | 5.99525 | 5.75902 | 9 |
| 10 | 8.11090 | 7.72173 | 7.36009 | 7.02358 | 6.71008 | 6.41766 | 6.14457 | 10 |
| 11 | 8.76048 | 8.30641 | 7.88687 | 7.49867 | 7.13896 | 6.80519 | 6.49506 | 11 |
| 12 | 9.38507 | 8.86325 | 8.38384 | 7.94269 | 7.53608 | 7.16073 | 6.81369 | 12 |
| 13 | 9.98565 | 9.39357 | 8.85268 | 8.35765 | 7.90378 | 7.48690 | 7.10336 | 13 |
| 14 | 10.56312 | 9.89864 | 9.29498 | 8.74547 | 8.24424 | 7.78615 | 7.36669 | 14 |
| 15 | 11.11839 | 10.37966 | 9.71225 | 9.10791 | 8.55948 | 8.06069 | 7.60608 | 15 |
| 16 | 11.65230 | 10.83777 | 10.10590 | 9.44665 | 8.85137 | 8.31256 | 7.82371 | 16 |
| 17 | 12.16567 | 11.27407 | 10.47726 | 9.76322 | 9.12164 | 8.54363 | 8.02155 | 17 |
| 18 | 12.65930 | 11.68959 | 10.82760 | 10.05909 | 9.37189 | 8.75563 | 8.20141 | 18 |
| 19 | 13.13394 | 12.08532 | 11.15812 | 10.33560 | 9.60360 | 8.95011 | 8.36492 | 19 |
| 20 | 13.59033 | 12.46221 | 11.46992 | 10.59401 | 9.81815 | 9.12855 | 8.51356 | 20 |
| 21 | 14.02916 | 12.82115 | 11.76408 | 10.83553 | 10.01680 | 9.29224 | 8.64869 | 21 |
| 22 | 14.45112 | 13.16300 | 12.04158 | 11.06124 | 10.20074 | 9.44243 | 8.77154 | 22 |
| 23 | 14.85684 | 13.48857 | 12.30338 | 11.27219 | 10.37106 | 9.58021 | 8.88322 | 23 |
| 24 | 15.24696 | 13.79864 | 12.55036 | 11.46933 | 10.52876 | 9.70661 | 8.98474 | 24 |
| 25 | 15.62208 | 14.09394 | 12.78336 | 11.65358 | 10.67478 | 9.82258 | 9.07704 | 25 |
| 26 | 15.98277 | 14.37519 | 13.00317 | 11.82578 | 10.80998 | 9.92897 | 9.16095 | 26 |
| 27 | 16.32959 | 14.64303 | 13.21053 | 11.98671 | 10.93516 | 10.02658 | 9.23722 | 27 |
| 28 | 16.66306 | 14.89813 | 13.40616 | 12.13711 | 11.05108 | 10.11613 | 9.30657 | 28 |
| 29 | 16.98371 | 15.14107 | 13.59072 | 12.27767 | 11.15841 | 10.19828 | 9.36961 | 29 |
| 30 | 17.29203 | 15.37245 | 13.76483 | 12.40904 | 11.25778 | 10.27365 | 9.42691 | 30 |
| 31 | 17.58849 | 15.59281 | 13.92909 | 12.53181 | 11.34980 | 10.34280 | 9.47901 | 31 |
| 32 | 17.87355 | 15.80268 | 14.08404 | 12.64656 | 11.43500 | 10.40624 | 9.52638 | 32 |
| 33 | 18.14765 | 16.00255 | 14.23023 | 12.75379 | 11.51389 | 10.46444 | 9.56943 | 33 |
| 34 | 18.41120 | 16.19290 | 14.36814 | 12.85401 | 11.58693 | 10.51784 | 9.60857 | 34 |
| 35 | 18.66461 | 16.37419 | 14.49825 | 12.94767 | 11.65457 | 10.56682 | 9.64416 | 35 |
| 36 | 18.90828 | 16.54685 | 14.62099 | 13.03521 | 11.71719 | 10.61176 | 9.67651 | 36 |
| 37 | 19.14258 | 16.71129 | 14.73678 | 13.11702 | 11.77518 | 10.65299 | 9.70592 | 37 |
| 38 | 19.36786 | 16.86789 | 14.84602 | 13.19347 | 11.82887 | 10.69082 | 9.73265 | 38 |
| 39 | 19.58448 | 17.01704 | 14.94907 | 13.26493 | 11.87858 | 10.72552 | 9.75696 | 39 |
| 40 | 19.79277 | 17.15909 | 15.04630 | 13.33171 | 11.92461 | 10.75736 | 9.77905 | 40 |
| 41 | 19.99305 | 17.29437 | 15.13802 | 13.39412 | 11.96723 | 10.78657 | 9.79914 | 41 |
| 42 | 20.18563 | 17.42321 | 15.22454 | 13.45245 | 12.00670 | 10.81337 | 9.81740 | 42 |
| 43 | 20.37079 | 17.54591 | 15.30617 | 13.50696 | 12.04324 | 10.83795 | 9.83400 | 43 |
| 44 | 20.54884 | 17.66277 | 15.38318 | 13.55791 | 12.07707 | 10.86051 | 9.84909 | 44 |
| 45 | 20.72004 | 17.77407 | 15.45583 | 13.60552 | 12.10840 | 10.88120 | 9.86281 | 45 |
| 46 | 20.88465 | 17.88007 | 15.52437 | 13.65002 | 12.13741 | 10.90018 | 9.87528 | 46 |
| 47 | 21.04294 | 17.98102 | 15.58903 | 13.69161 | 12.16427 | 10.91760 | 9.88662 | 47 |
| 48 | 21.19513 | 18.07716 | 15.65003 | 13.73047 | 12.18914 | 10.93358 | 9.89693 | 48 |
| 49 | 21.34147 | 18.16872 | 15.70757 | 13.76680 | 12.21216 | 10.94823 | 9.90630 | 49 |
| 50 | 21.48218 | 18.25593 | 15.76186 | 13.80075 | 12.23348 | 10.96168 | 9.91481 | 50 |
| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |

**TEACHER'S COPY**

# MATHEMATICS 33

## FINAL TEST

## GENERAL INSTRUCTIONS

1. The time limit for this test is **$2\frac{1}{2}$ hours.**

2. There are **100 marks** on this test.

   PART A: Multiple Choice - 50 marks

   PART B: Written Response - 50 marks

3. Calculators that are not programmed may be used.

4. All necessary tables and a list of formulas have been provided at the end of the test.

5. It is better to complete all work which you know well first. After that you can deal with the difficult ones. Do not spend too much time on any one problem. If you finish the test before the $2\frac{1}{2}$ hour time limit, go back and check your answers.

# PART A: MULTIPLE CHOICE

In each of the questions, indicate the correct answer by placing the appropriate letter A, B, C, or D in the blank provided.

Example:

B The value of $2^3$ is

A. 6

B. 8

C. $-8$

D. $-6$

_____ 1. Which one of the following does NOT contain like radicals?

A. $12\sqrt{12}$ and $15\sqrt{3}$

B. $17\sqrt{2}$ and $4\sqrt{8}$

C. $3\sqrt{15}$ and $5\sqrt{5}$

D. $4\sqrt{5}$ and $2\sqrt{20}$

_____ 2. The simplest form of $8\sqrt{3} \times 3\sqrt{6}$ is

A. $\sqrt{324}$

B. $18\sqrt{6}$

C. $36\sqrt{2}$

D. $72\sqrt{2}$

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 3. Simplify $\frac{16}{2-\sqrt{2}}$.

A. $16-8\sqrt{2}$

B. $16+8\sqrt{2}$

C. $32+16\sqrt{2}$

D. $32\sqrt{2}$

_____ 4. Which of the following expressions is NOT a rational expression?

A. $\frac{5x^3-x+3}{x-4}$

B. $\frac{3x^{\frac{3}{2}}-2x^{\frac{1}{2}}-2}{x-2}$

C. $\frac{3x^{\frac{6}{2}}-2x^{\frac{2}{2}}-1}{x-2}$

D. $\frac{3x^6-2x+3}{x-4}$

_____ 5. Reduce $\frac{(16-x^2)(x+4)}{x^2+8x+16}$ to its lowest terms. The result is

A. $x+4$

B. $x-4$

C. $4-x$

D. $-(x+4)$

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 6. Find the value of $x$ in the equation $\frac{11}{2}-\frac{2}{x}=\frac{1}{x}+1$ where $x \neq 0$.

A. $x=\frac{1}{3}$

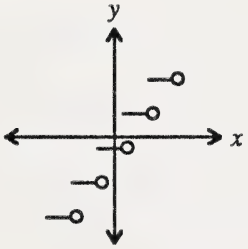
B. $x=\frac{2}{3}$

C. $x=\frac{3}{2}$

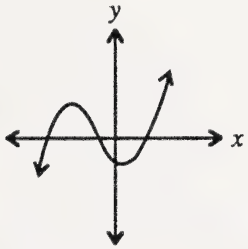
D. $x=2$

_____ 7. Which of the following graphs is NOT a function?

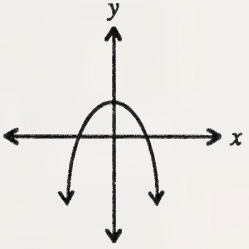
A.



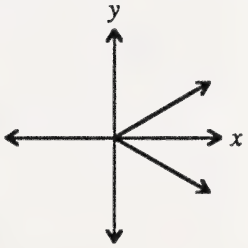

B.




C.




D.




Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 8. Which one of the following statements is false with respect to the equation $y=3(x-1)^2$?

A. The axis of symmetry is $x=-1$.

B. The domain is $R$.

C. The vertex is at $(1, 0)$.

D. The graph opens upwards.

_____ 9. Which one of the following is the general equation for a parabola?

A. $y=a(x+k)^2-h$

B. $y=a(x-h)^2+k$

C. $y=a(x+h)^2-k$

D. $y=a(x-k)^2+h$

_____ 10. Which of the following are the solutions to the quadratic equation $2x^2+5x=33$?

A. $-5\frac{1}{2}$ and $-3$

B. $\frac{11}{2}$ and 3

C. $-3$ and $5\frac{1}{2}$

D. $-\frac{11}{2}$ and 3

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 11. Use the quadratic formula to establish that the roots of $x^2 + 3x = 5x - x^2 + 2$ are

A. $\frac{1 \pm \sqrt{-5}}{2}$

B. $\frac{1 \pm \sqrt{5}}{2}$

C. $\frac{-1 \pm \sqrt{-5}}{2}$

D. $\frac{-1 \pm \sqrt{5}}{2}$

_____ 12. What are the coordinates of the vertex for the function $y = -5(x+2)^2 + 3$?

A. $(2, -3)$

B. $(2, 3)$

C. $(-2, -3)$

D. $(-2, 3)$

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 13. What is the general equation for secant?

A. $\sec\theta = \frac{r}{x}$

B. $\sec\theta = \frac{r}{y}$

C. $\sec\theta = \frac{x}{y}$

D. $\sec\theta = \frac{y}{x}$

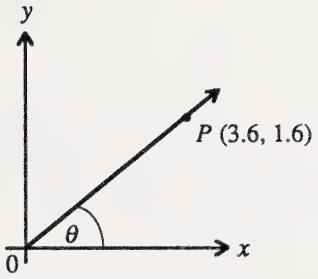
_____ 14. If $P(3.6, 1.6)$ is a point on the grid, and $\theta$ is the angle formed by $\overrightarrow{OP}$ and the horizontal, calculate $\sin\theta$ to four decimal places.

A. 0.9095

B. 0.4061

C. 0.4158

D. 0.5140




_____ 15. Triangle $ABC$ is an obtuse triangle in which $\angle B = 40°$, $AC = 8$ cm, and $BC = 11$ cm. Determine $\angle A$ to the nearest degree.

A. 50°

B. 62°

C. 54°

D. 47°

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 16. The value of cot 352° is equal to

A. cot 92°

B. −cot 92°

C. cot 8°

D. −cot 8°

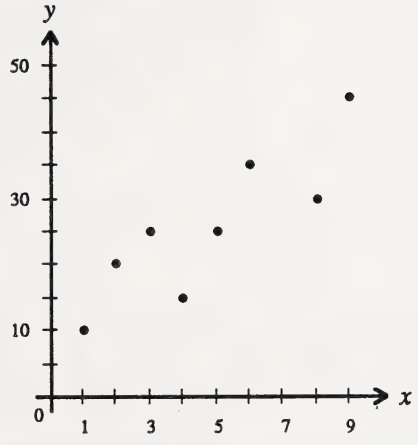
_____ 17. What plot is depicted by the following?

A. hinge-box plot

B. scatter plot

C. whisker-box plot

D. stem-leaf plot




_____ 18. What measure of central tendency is used for constructing a box and whisker plot?

A. mode

B. percentile

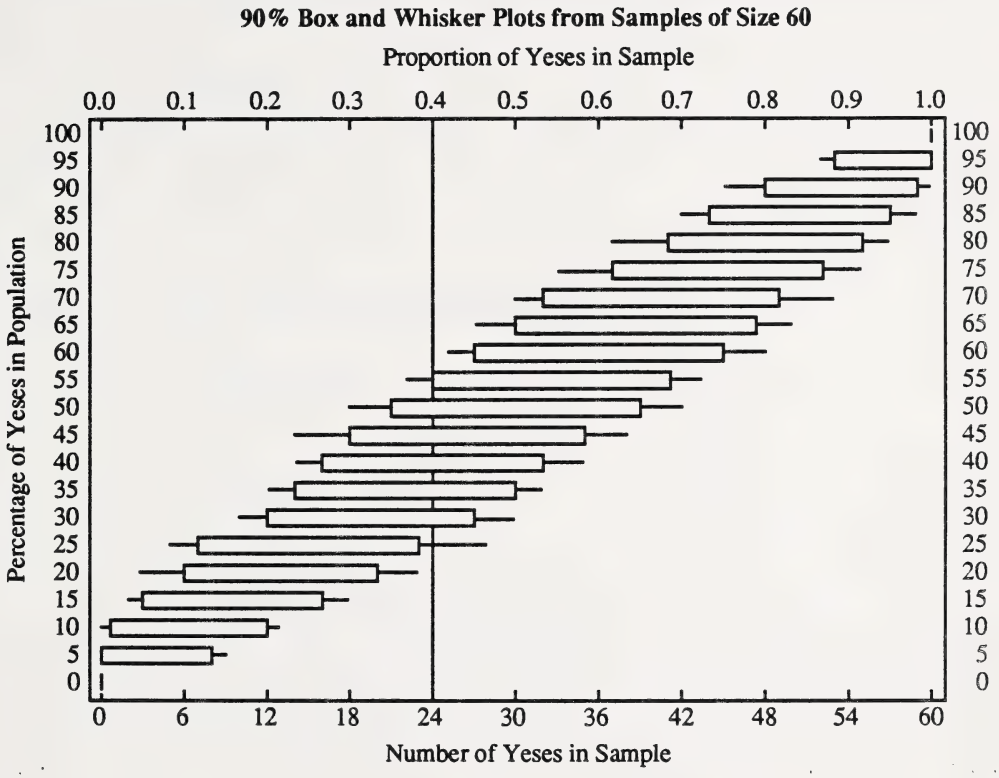
C. median

D. mean

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

Answer questions 19 and 20 using the following chart.


90% Box and Whisker Plots from Samples of Size 60
Proportion of Yeses in Sample
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Percentage of Yeses in Population
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
0 6 12 18 24 30 36 42 48 54 60
Number of Yeses in Sample

_____ 19. A pharmaceutical company has data from a sample of 60 people in which 24 of the people responded favourably. What population percentages are likely for this situation?

A. 30 - 55

B. 50 - 70

C. 15 - 35

D. 80 - 95

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 20. What is the range of the number of yeses for a population percentage of 65?

A. 27 - 50

B. 30 - 50

C. 30 - 47

D. 27 - 47

_____ 21. The formula for the amount of an annuity is

A. $\frac{R\left[1-(1+i)^{n}\right]}{i}$

B. $P(1+i)^{n}$

C. $\frac{R\left[(1+i)^{n}-1\right]}{i}$

D. $\frac{A}{(1+i)^{n}}$

_____ 22. The amount of $2000 invested at 11.25%/a and compounded semiannually for four years is

A. $3063.59

B. $2489.41

C. $2496.88

D. $3098.59

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

_____ 23. The present value of an annuity may be expressed as $PV = 50s_{\overline{8}|6\%}$. This means the same as

A. $\dfrac{50\left[1-(1.06)^{-8}\right]}{0.06}$

B. $50(0.06)(8)$

C. $50(1.06)^{8}$

D. $\dfrac{50(1.06)^{8}}{1.06}$

_____ 24. The period of time when one particular rate is charged for a mortgage is called

A. the life of the mortgage

B. the term of the mortgage

C. the turn-over period

D. the amortization period

_____ 25. Karen Moorehead obtained a mortgage of \$95 000 at $10\frac{3}{4}$%/a for thirty years. What will be the total amount of Karen's monthly payments?

A. \$998.02

B. \$937.87

C. \$923.54

D. \$870.20

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

**Value**

## PART B: WRITTEN RESPONSE

Be sure to show all your work. Part marks will be given for partially correct solutions.

(3) 1. The difference of the squares of two numbers is 47. If one of the numbers is one greater than the other number, what are the two numbers?

(3) 2. A spray is used to kill certain bugs. The number of bugs killed depends on the length of time the spray is used. The number of bugs is given by

$n = \sqrt{5b + t^2} + 3$, where $n$ is the final number of bugs,
$b$ is the initial number of bugs, and
$t$ is the time (in seconds) of spraying.

If there are 750 insects initially and the spraying goes on for fifteen seconds, how many insects will be left?

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

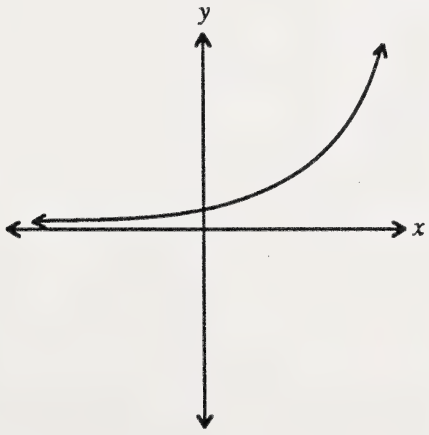
3. If $f(x)=2x^2+1$ and $g(x)=x-1$, find the following:

(1) a. $g[f(x)]$

(1) b. $f[g(x)]$

4. Identify the following types of functions.

(1) a.

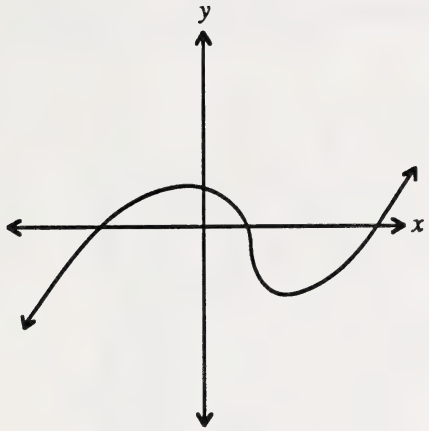



_____

Name of Student _____ Student I.D. # _____

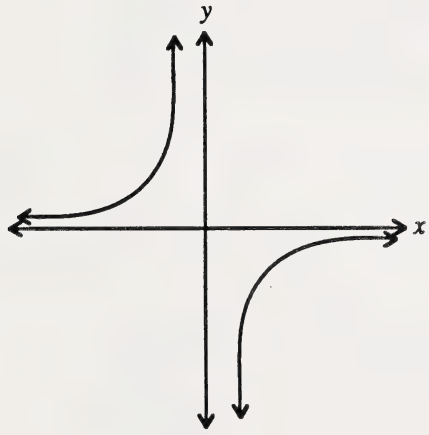
Name of School _____ Date _____

(1) b.




_____

(1) c.



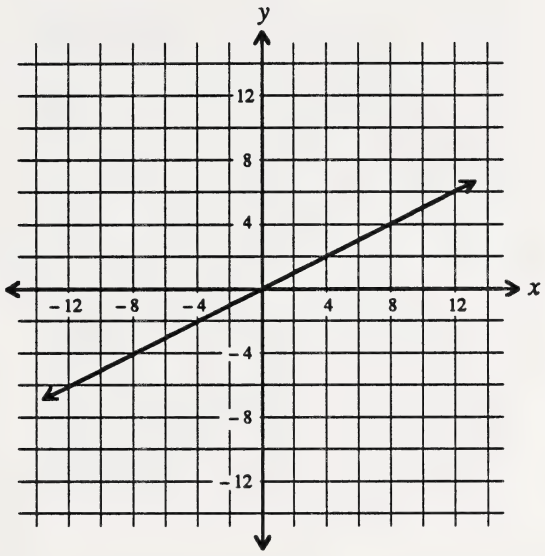

_____

Name of Student _____ Student I.D. # _____

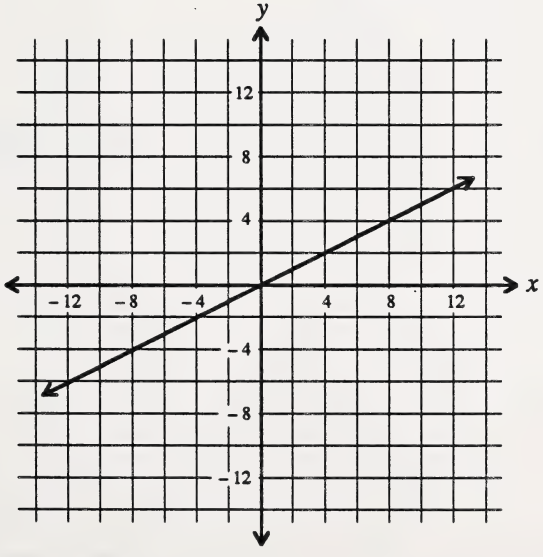
Name of School _____ Date _____

5. Sketch the graphs of the following transformations.

(1) a. $y = f(x) + 2$



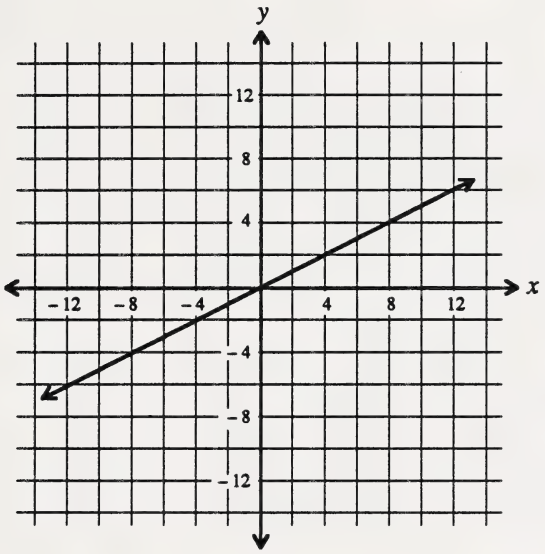

(1) b. $y = f(x - 3)$




Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(1) c. $y=\frac{1}{2}f(x)+4$




6. The area of a rectangle is equal to the length times the width.

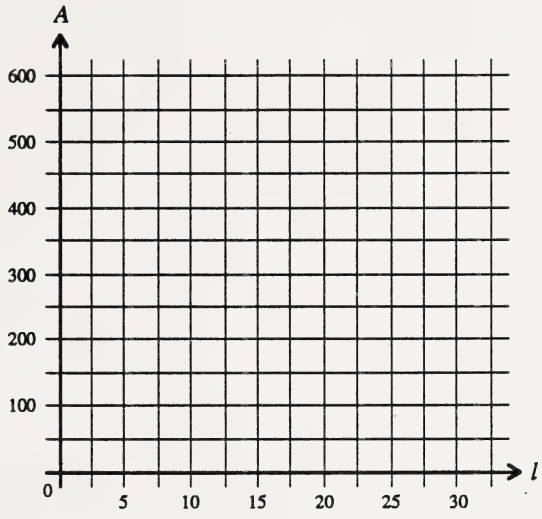
(1) a. Write an expression for this function.

(1) b. Evaluate the expression for the area of a rectangle where the width is 12 cm and the length is 21 cm.

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(2) c. Sketch the graph of the function for the area of a rectangle with a constant width of 14 cm.




(1) d. According to the graph, what area of the rectangle has a length of 29 cm?

(2) 7. Rewrite the quadratic function $y = 5x^2 - 15x + 7$ into the form $y = a(x-h)^2 + k$.

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(5) 8. What is the value of $t$ when $h = 50$ for the function $h = -5t^2 + 75t + 3$?

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

9. The trajectory of a football is described by the function $h = -5t^2 + 65t$. Find the following:

(2) a. the maximum height reached by the football

(1) b. the time required to reach the maximum height

(1) c. the total time the football is in the air

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(3) 10. State the two roots for the quadratic equation $5x^2 + 6x = 2$.

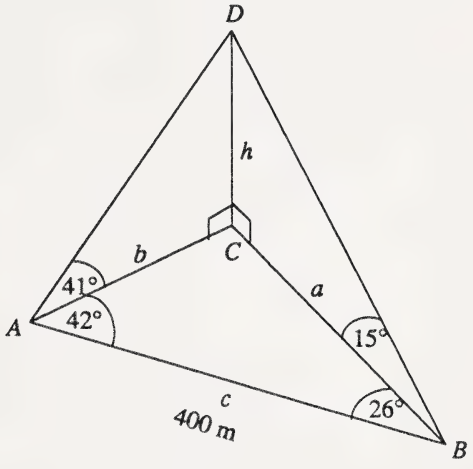
(3) 11. The angle of elevation to the top of a tower from a point $H$ on the ground is 34°. If the distance from point $H$ to the centre of the base of the tower is 125 m, how high is the tower? Round to the nearest metre.

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(3)

12. A setup for tracking model rockets is shown in the accompanying diagram. The rocket is launched from position $C$ and reaches the height at point $D$. Observers at points $A$ and $B$ measure the angles of elevation. What is the height of the rocket at point $D$?




Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

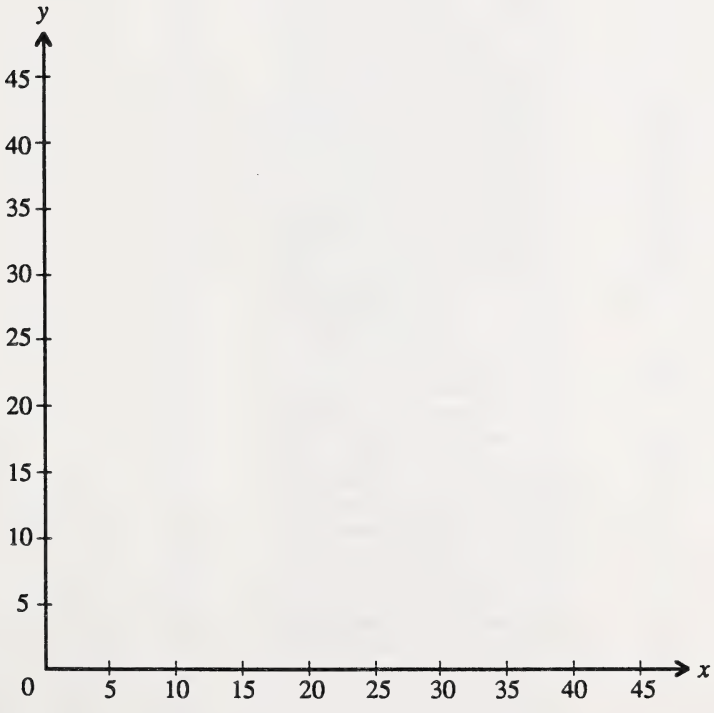
(2) 13. If $\cot\theta = 3.4$, find $\sin\theta$ and $\cos\theta$.

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(2) 14. Plot the following bivariate data and the line of best fit.

| $x$ | $y$ |
|---|---|
| 17 | 19 |
| 35 | 37 |
| 17 | 20 |
| 16 | 19 |
| 34 | 35 |
| 19 | 20 |
| 32 | 34 |
| 19 | 22 |
| 38 | 38 |
| 34 | 37 |
| 36 | 38 |
| 28 | 28 |
| 21 | 25 |
| 44 | 46 |
| 41 | 44 |
| 40 | 41 |




Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

15. Do the following.

(2) a. Construct a sampling distribution for the following data.

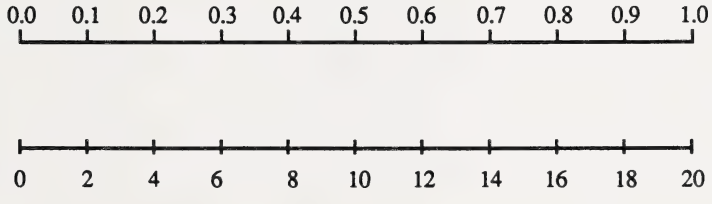
| Sample Number | Results | Number of Yeses |
|---|---|---|
| 1 | NNNNNYNNYNNNYYYNYNNY | 7 |
| 2 | NNNYYNNNYNNYNNNNNNNN | 4 |
| 3 | NNNYNNYNYNNNNNYNNYNY | 6 |
| 4 | NNNNNYNNYNNYNNYNNYYN | 6 |
| 5 | NNNNYNYNYNYYNNNNNYYN | 7 |
| 6 | NNNNYNNNNYNNNNYNNYNN | 4 |
| 7 | NNNNNYNNNNNYYYNNYNYY | 7 |
| 8 | NNYNYNNNYYNNYNYYYNNN | 8 |
| 9 | YNNNYNNYNNNYYNNNYNNY | 7 |
| 10 | YNNNNNNNYNNNYYYNNNNY | 6 |
| 11 | NNNNNNNYNNNNNYNNNNYN | 3 |
| 12 | YNNYYYYYNNYNYNNNYNNN | 9 |
| 13 | NNYNNYYNNNYYYNNNNNYY | 8 |
| 14 | NNNNYNYNNNNNNYNNNNYN | 4 |
| 15 | NYNNNYNNNNNNYNNYNYYN | 6 |
| 16 | NNNNYNNNNNNNNNNNNNNN | 1 |
| 17 | NYNNYYNYYNNYNNNYNYYN | 9 |
| 18 | NNYNNYNNYNNNNYYNNNYN | 6 |
| 19 | YNNYYNNYNNYYNNNYNNNY | 8 |
| 20 | NNNNNNNNNNNNYNNNYNYN | 3 |
| 21 | NNNNNYNNNNYNNNNNNYNN | 3 |
| 22 | YNNNNYYNNNNYYNNNNNNN | 5 |
| 23 | NNNNYNNNYYYNNNYNNNYY | 7 |
| 24 | NNYYYNNNYYYNNYYNNYNN | 9 |
| 25 | NNNYNNNYNNNNNNYNNNYY | 5 |
| 26 | YYNNNYNNNYNNNNNNNNNN | 4 |
| 27 | YNYNNNNYNNNYNYNNNNYNY | 7 |
| 28 | YNNNYYNYNYNNYNNNYNNY | 8 |
| 29 | YNYNNNNYYNNYYNYYNNNN | 8 |
| 30 | NNYNNNNYYNNYNNYNNNYY | 7 |
| 31 | NNNNNNNYNNNNNNNYNNNN | 2 |
| 32 | YNYYNNYNNNNNNYYYYNNY | 9 |
| 33 | NYNNNYNNNNNNNYNNNNNN | 3 |
| 34 | YNYNNYYNNNNNYNYYNYNY | 9 |
| 35 | YNNNNNYNNNYNYNYYNNNY | 7 |
| 36 | YNNYYNNYNYNYYNNNNYNN | 8 |
| 37 | NYNNNYNYNNYNNYYNYNNN | 7 |
| 38 | NNNNNNYNNNYNNNYYYYNN | 6 |
| 39 | YYYNNNNNNNNYYYNNNNYY | 9 |
| 40 | NNNYNNNYYNNNNNYNNYNY | 6 |
| 41 | NYYYNNNNNNNNYNNNNNYY | 6 |
| 42 | YYYYYNNNYNNNYNYNNYYN | 10 |
| 43 | YYNYNNNNNYNNNYNNYNYN | 7 |
| 44 | NNNNNYNNNNNNNYNYNYNNN | 4 |
| 45 | NNNYYYYNNYYNYNYNYNNN | 9 |
| 46 | NNYYYYNNYNYNYNYNYNYY | 11 |
| 47 | NNNNYNNNYNYNNNNNNYYN | 5 |
| 48 | NNNNYYYNNNYNNNNYNNNY | 6 |
| 49 | NYYNNNYNNNNNNYNYNYYN | 7 |
| 50 | NYNNYNNYNNNYNNNYNYNY | 7 |

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

| Number of Yeses | Sample Proportion | Frequency | Proportion of all Trials |
|---|---|---|---|
| 0 | 0.00 | | |
| 1 | 0.05 | | |
| 2 | 0.10 | | |
| 3 | 0.15 | | |
| 4 | 0.20 | | |
| 5 | 0.25 | | |
| 6 | 0.30 | | |
| 7 | 0.35 | | |
| 8 | 0.40 | | |
| 9 | 0.45 | | |
| 10 | 0.50 | | |
| 11 | 0.55 | | |
| 12 | 0.60 | | |
| 13 | 0.65 | | |
| 14 | 0.70 | | |
| 15 | 0.75 | | |
| 16 | 0.80 | | |
| 17 | 0.85 | | |
| 18 | 0.90 | | |
| 19 | 0.95 | | |
| 20 | 1.00 | | |

(2) b. Construct the box and whisker plot for the sampling distribution.




Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

(3) 16. Joan Horn paid off a three-year loan using nonblended payments. What was the total amount that Joan returned to the bank if she paid off $250 of the principal each month and the bank charged $10\frac{1}{2}\%/a$ for the loan? Round to the nearest cent.

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

## Monthly Payments Including Principal and Interest for a Mortgage of $1000

| YEARS | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
|---|---|---|---|---|---|---|---|
| RATE (%) | | | | | | | |
| 8 | 20.21 | 12.06 | 9.48 | 8.28 | 7.63 | 7.25 | 7.01 |
| 8 1/4 | 20.33 | 12.19 | 9.62 | 8.43 | 7.79 | 7.42 | 7.18 |
| 8 1/2 | 20.45 | 12.32 | 9.76 | 8.59 | 7.96 | 7.59 | 7.37 |
| 8 3/4 | 20.56 | 12.45 | 9.90 | 8.74 | 8.12 | 7.76 | 7.54 |
| 9 | 20.69 | 12.58 | 10.05 | 8.89 | 8.28 | 7.93 | 7.72 |
| 9 1/4 | 20.80 | 12.71 | 10.19 | 9.05 | 8.44 | 8.10 | 7.90 |
| 9 1/2 | 20.91 | 12.84 | 10.33 | 9.20 | 8.61 | 8.28 | 8.08 |
| 9 3/4 | 21.03 | 12.97 | 10.48 | 9.36 | 8.78 | 8.45 | 8.26 |
| 10 | 21.15 | 13.10 | 10.62 | 9.52 | 8.94 | 8.63 | 8.44 |
| 10 1/4 | 21.27 | 13.24 | 10.77 | 9.68 | 9.11 | 8.80 | 8.63 |
| 10 1/2 | 21.38 | 13.37 | 10.92 | 9.83 | 9.28 | 8.98 | 8.81 |
| 10 3/4 | 21.50 | 13.50 | 11.06 | 10.00 | 9.45 | 9.16 | 8.99 |
| 11 | 21.62 | 13.64 | 11.21 | 10.16 | 9.63 | 9.34 | 9.18 |
| 11 1/4 | 21.74 | 13.77 | 11.36 | 10.32 | 9.80 | 9.52 | 9.37 |
| 11 1/2 | 21.86 | 13.91 | 11.51 | 10.48 | 9.97 | 9.70 | 9.55 |
| 11 3/4 | 21.98 | 14.04 | 11.66 | 10.65 | 10.14 | 9.88 | 9.74 |
| 12 | 22.10 | 14.18 | 11.82 | 10.81 | 10.32 | 10.06 | 9.93 |
| 12 1/4 | 22.22 | 14.32 | 11.97 | 10.98 | 10.50 | 10.25 | 10.12 |
| 12 1/2 | 22.34 | 14.46 | 12.13 | 11.15 | 10.68 | 10.43 | 10.31 |
| 12 3/4 | 22.46 | 14.60 | 12.28 | 11.31 | 10.85 | 10.62 | 10.50 |
| 13 | 22.59 | 14.74 | 12.44 | 11.48 | 11.03 | 10.97 | 10.69 |
| 13 1/4 | 22.71 | 14.88 | 12.59 | 11.65 | 11.21 | 10.99 | 10.88 |
| 13 1/2 | 22.83 | 15.02 | 12.75 | 11.82 | 11.38 | 11.17 | 11.07 |
| 13 3/4 | 22.95 | 15.16 | 12.90 | 11.99 | 11.56 | 11.36 | 11.26 |
| 14 | 23.07 | 15.30 | 13.06 | 12.16 | 11.74 | 11.54 | 11.45 |
| 14 1/4 | 23.19 | 15.44 | 13.22 | 12.33 | 11.92 | 11.73 | 11.64 |
| 14 1/2 | 23.31 | 15.58 | 13.38 | 12.50 | 12.10 | 11.92 | 11.83 |
| 14 3/4 | 23.44 | 15.72 | 13.54 | 12.67 | 12.29 | 12.10 | 12.02 |
| 15 | 23.56 | 15.87 | 13.70 | 12.84 | 12.47 | 12.29 | 12.21 |
| 15 1/4 | 23.68 | 16.01 | 13.86 | 13.02 | 12.65 | 12.48 | 12.40 |
| 15 1/2 | 23.81 | 16.15 | 14.02 | 13.19 | 12.83 | 12.67 | 12.59 |
| 15 3/4 | 23.93 | 16.30 | 14.18 | 13.36 | 13.01 | 12.86 | 12.78 |
| 16 | 24.05 | 16.44 | 14.34 | 13.54 | 13.20 | 13.04 | 12.97 |
| 16 1/4 | 24.18 | 16.59 | 14.50 | 13.71 | 13.38 | 13.23 | 13.17 |
| 16 1/2 | 24.30 | 16.73 | 14.66 | 13.89 | 13.56 | 13.42 | 13.36 |
| 16 3/4 | 24.43 | 16.88 | 14.83 | 14.06 | 13.75 | 13.61 | 13.55 |
| 17 | 24.55 | 17.02 | 14.99 | 14.24 | 13.93 | 13.80 | 13.74 |
| 17 1/4 | 24.68 | 17.17 | 15.16 | 14.42 | 14.11 | 13.99 | 13.93 |
| 17 1/2 | 24.80 | 17.32 | 15.32 | 14.59 | 14.30 | 14.18 | 14.12 |
| 17 3/4 | 24.93 | 17.47 | 15.49 | 14.77 | 14.48 | 14.36 | 14.31 |
| 18 | 25.05 | 17.61 | 15.65 | 14.95 | 14.67 | 14.55 | 14.51 |
| 18 1/4 | 25.18 | 17.76 | 15.82 | 15.13 | 14.85 | 14.74 | 14.70 |
| 18 1/2 | 25.30 | 17.91 | 15.98 | 15.30 | 15.04 | 14.93 | 14.89 |
| 18 3/4 | 25.43 | 18.06 | 16.15 | 15.48 | 15.23 | 15.12 | 15.08 |
| 19 | 25.56 | 18.21 | 16.32 | 15.66 | 15.41 | 15.31 | 15.27 |
| 19 1/4 | 25.68 | 18.36 | 16.49 | 15.84 | 15.60 | 15.50 | 15.46 |
| 19 1/2 | 25.81 | 18.51 | 16.65 | 16.02 | 15.78 | 15.69 | 15.65 |
| 19 3/4 | 25.94 | 18.66 | 16.82 | 16.20 | 15.97 | 15.88 | 15.85 |
| 20 | 26.06 | 18.81 | 16.99 | 16.38 | 16.15 | 16.07 | 16.04 |

# AMOUNT OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{(1+i)^n - 1}{i}$$

| $n$ | ½% | 1% | 1½% | 2% | 2½% | 3% | 3½% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1 |
| 2 | 2.00500 | 2.01000 | 2.01500 | 2.02000 | 2.02500 | 2.03000 | 2.03500 | 2 |
| 3 | 3.01503 | 3.03010 | 3.04523 | 3.06040 | 3.07563 | 3.09090 | 3.10623 | 3 |
| 4 | 4.03010 | 4.06040 | 4.09090 | 4.12161 | 4.15252 | 4.18363 | 4.21494 | 4 |
| 5 | 5.05025 | 5.10101 | 5.15227 | 5.20404 | 5.25633 | 5.30914 | 5.36247 | 5 |
| 6 | 6.07550 | 6.15202 | 6.22955 | 6.30812 | 6.38774 | 6.46841 | 6.55015 | 6 |
| 7 | 7.10588 | 7.21354 | 7.32299 | 7.43428 | 7.54743 | 7.66246 | 7.77948 | 7 |
| 8 | 8.14141 | 8.28567 | 8.43284 | 8.58297 | 8.73612 | 8.89237 | 9.05169 | 8 |
| 9 | 9.18212 | 9.36853 | 9.55933 | 9.75463 | 9.95452 | 10.15911 | 10.36850 | 9 |
| 10 | 10.22803 | 10.46221 | 10.70272 | 10.94972 | 11.20338 | 11.46388 | 11.73139 | 10 |
| 11 | 11.27917 | 11.56683 | 11.86326 | 12.16872 | 12.48347 | 12.80780 | 13.14199 | 11 |
| 12 | 12.33556 | 12.68250 | 13.04121 | 13.41209 | 13.79555 | 14.19203 | 14.60196 | 12 |
| 13 | 13.39724 | 13.80933 | 14.23683 | 14.68033 | 15.14044 | 15.61779 | 16.11303 | 13 |
| 14 | 14.46423 | 14.94742 | 15.45038 | 15.97394 | 16.51895 | 17.08632 | 17.67698 | 14 |
| 15 | 15.53655 | 16.09690 | 16.68214 | 17.29342 | 17.93193 | 18.59891 | 19.29568 | 15 |
| 16 | 16.61423 | 17.25786 | 17.93237 | 18.63929 | 19.38022 | 20.15688 | 20.97103 | 16 |
| 17 | 17.69730 | 18.43044 | 19.20136 | 20.01207 | 20.86473 | 21.76159 | 22.70502 | 17 |
| 18 | 18.78579 | 19.61475 | 20.48938 | 21.41231 | 22.38635 | 23.41444 | 24.49969 | 18 |
| 19 | 19.87972 | 20.81090 | 21.79672 | 22.84056 | 23.94601 | 25.11687 | 26.35718 | 19 |
| 20 | 20.97912 | 22.01900 | 23.12367 | 24.29737 | 25.54466 | 26.87037 | 28.27968 | 20 |
| 21 | 22.08401 | 23.23919 | 24.47052 | 25.78332 | 27.18327 | 28.67649 | 30.26947 | 21 |
| 22 | 23.19443 | 24.47159 | 25.83758 | 27.29898 | 28.86286 | 30.53678 | 32.32890 | 22 |
| 23 | 24.31040 | 25.71630 | 27.22514 | 28.84496 | 30.58443 | 32.45288 | 34.46041 | 23 |
| 24 | 25.43196 | 26.97346 | 28.63352 | 30.42186 | 32.34904 | 34.42647 | 36.66653 | 24 |
| 25 | 26.55912 | 28.24320 | 30.06302 | 32.03030 | 34.15776 | 36.45926 | 38.94986 | 25 |
| 26 | 27.69191 | 29.52563 | 31.51397 | 33.67091 | 36.01171 | 38.55304 | 41.31310 | 26 |
| 27 | 28.83037 | 30.82089 | 32.98668 | 35.34432 | 37.91200 | 40.70963 | 43.75906 | 27 |
| 28 | 29.97452 | 32.12910 | 34.48148 | 37.05121 | 39.85980 | 42.93092 | 46.29063 | 28 |
| 29 | 31.12439 | 33.45039 | 35.99870 | 38.79223 | 41.85630 | 45.21885 | 48.91080 | 29 |
| 30 | 32.28002 | 34.78489 | 37.53868 | 40.56808 | 43.90270 | 47.57546 | 51.62268 | 30 |
| 31 | 33.44142 | 36.13274 | 39.10176 | 42.37944 | 46.00027 | 50.00268 | 54.42947 | 31 |
| 32 | 34.60862 | 37.49408 | 40.68829 | 44.22703 | 48.15028 | 52.50276 | 57.33450 | 32 |
| 33 | 35.78167 | 38.86901 | 42.29861 | 46.11157 | 50.35403 | 55.07784 | 60.34121 | 33 |
| 34 | 36.96058 | 40.25770 | 43.93309 | 48.03380 | 52.61289 | 57.73018 | 63.45315 | 34 |
| 35 | 38.14538 | 41.66028 | 45.59209 | 49.99448 | 54.92821 | 60.46208 | 66.67401 | 35 |
| 36 | 39.33611 | 43.07688 | 47.27597 | 51.99437 | 57.30141 | 63.27594 | 70.00760 | 36 |
| 37 | 40.53279 | 44.50765 | 48.98511 | 54.03425 | 59.73395 | 66.17422 | 73.45787 | 37 |
| 38 | 41.73545 | 45.95272 | 50.71989 | 56.11494 | 62.22730 | 69.15945 | 77.02889 | 38 |
| 39 | 42.94413 | 47.41225 | 52.48068 | 58.23724 | 64.78298 | 72.23423 | 80.72491 | 39 |
| 40 | 44.15885 | 48.88637 | 54.26789 | 60.40198 | 67.40255 | 75.40126 | 84.55028 | 40 |
| 41 | 45.37964 | 50.37524 | 56.08191 | 62.61002 | 70.08762 | 78.66330 | 88.50954 | 41 |
| 42 | 46.60654 | 51.87899 | 57.92314 | 64.86222 | 72.83981 | 82.02320 | 92.60737 | 42 |
| 43 | 47.83957 | 53.39778 | 59.79199 | 67.15947 | 75.66080 | 85.48389 | 96.84863 | 43 |
| 44 | 49.07877 | 54.93176 | 61.68887 | 69.50266 | 78.55232 | 89.04841 | 101.23831 | 44 |
| 45 | 50.32416 | 56.48107 | 63.61420 | 71.89271 | 81.51613 | 92.71986 | 105.78162 | 45 |
| 46 | 51.57579 | 58.04589 | 65.56841 | 74.33056 | 84.55403 | 96.50146 | 110.48403 | 46 |
| 47 | 52.83366 | 59.62634 | 67.55194 | 76.81718 | 87.66789 | 100.39650 | 115.35097 | 47 |
| 48 | 54.09783 | 61.22261 | 69.56522 | 79.35352 | 90.85958 | 104.40840 | 120.38826 | 48 |
| 49 | 55.36832 | 62.83483 | 71.60870 | 81.94059 | 94.13107 | 108.54065 | 125.60185 | 49 |
| 50 | 56.64516 | 64.46318 | 73.68283 | 84.57940 | 97.48435 | 112.79687 | 130.99791 | 50 |
| $n$ | ½% | 1% | 1½% | 2% | 2½% | 3% | 3½% | $n$ |

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

# AMOUNT OF AN ANNUITY

$$S_{\overline{n}|i} = \frac{(1+i)^n - 1}{i}$$

| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1 |
| 2 | 2.04000 | 2.05000 | 2.06000 | 2.07000 | 2.08000 | 2.09000 | 2.10000 | 2 |
| 3 | 3.12160 | 3.15250 | 3.18360 | 3.21490 | 3.24640 | 3.27810 | 3.31000 | 3 |
| 4 | 4.24646 | 4.31013 | 4.37462 | 4.43994 | 4.50611 | 4.57313 | 4.64100 | 4 |
| 5 | 5.41632 | 5.52563 | 5.63709 | 5.75074 | 5.86660 | 5.98471 | 6.10510 | 5 |
| 6 | 6.63298 | 6.80191 | 6.97532 | 7.15329 | 7.33593 | 7.52333 | 7.71561 | 6 |
| 7 | 7.89829 | 8.14201 | 8.39384 | 8.65402 | 8.92280 | 9.20043 | 9.48717 | 7 |
| 8 | 9.21423 | 9.54911 | 9.89747 | 10.25980 | 10.63663 | 11.02847 | 11.43589 | 8 |
| 9 | 10.58280 | 11.02656 | 11.49132 | 11.97799 | 12.48756 | 13.02104 | 13.57948 | 9 |
| 10 | 12.00611 | 12.57789 | 13.18079 | 13.81645 | 14.48656 | 15.19293 | 15.93742 | 10 |
| 11 | 13.48635 | 14.20679 | 14.97164 | 15.78360 | 16.64549 | 17.56029 | 18.53117 | 11 |
| 12 | 15.02581 | 15.91713 | 16.86994 | 17.88845 | 18.97713 | 20.14072 | 21.38428 | 12 |
| 13 | 16.62684 | 17.71298 | 18.88214 | 20.14064 | 21.49530 | 22.95338 | 24.52271 | 13 |
| 14 | 18.29191 | 19.59863 | 21.01507 | 22.55049 | 24.21492 | 26.01919 | 27.97498 | 14 |
| 15 | 20.02359 | 21.57856 | 23.27597 | 25.12902 | 27.15211 | 29.36092 | 31.77248 | 15 |
| 16 | 21.82453 | 23.65749 | 25.67253 | 27.88805 | 30.32428 | 33.00330 | 35.94973 | 16 |
| 17 | 23.69751 | 25.84037 | 28.21288 | 30.84022 | 33.75023 | 36.97370 | 40.54470 | 17 |
| 18 | 25.64541 | 28.13238 | 30.90565 | 33.99903 | 37.45024 | 41.30134 | 45.59917 | 18 |
| 19 | 27.67123 | 30.53900 | 33.75999 | 37.37896 | 41.44626 | 46.01846 | 51.15909 | 19 |
| 20 | 29.77808 | 33.06595 | 36.78559 | 40.99549 | 45.76196 | 51.16012 | 57.27500 | 20 |
| 21 | 31.96920 | 35.71925 | 39.99273 | 44.86518 | 50.42292 | 56.76453 | 64.00250 | 21 |
| 22 | 34.24797 | 38.50521 | 43.39229 | 49.00574 | 55.45676 | 62.87334 | 71.40275 | 22 |
| 23 | 36.61789 | 41.43048 | 46.99583 | 53.43614 | 60.89330 | 69.53194 | 79.54302 | 23 |
| 24 | 39.08260 | 44.50200 | 50.81558 | 58.17667 | 66.76476 | 76.78981 | 88.49733 | 24 |
| 25 | 41.64591 | 47.72710 | 54.86451 | 63.24904 | 73.10594 | 84.70090 | 98.34706 | 25 |
| 26 | 44.31174 | 51.11345 | 59.15638 | 68.67647 | 79.95442 | 93.32398 | 109.18177 | 26 |
| 27 | 47.08421 | 54.66913 | 63.70577 | 74.48382 | 87.35077 | 102.72313 | 121.09994 | 27 |
| 28 | 49.96758 | 58.40258 | 68.52811 | 80.69769 | 95.33883 | 112.96822 | 134.20994 | 28 |
| 29 | 52.96629 | 62.32271 | 73.63980 | 87.34653 | 103.96594 | 124.13536 | 148.63093 | 29 |
| 30 | 56.08494 | 66.43885 | 79.05819 | 94.46079 | 113.28321 | 136.30754 | 164.49402 | 30 |
| 31 | 59.32834 | 70.76079 | 84.80168 | 102.07304 | 123.34587 | 149.57522 | 181.94342 | 31 |
| 32 | 62.70147 | 75.29883 | 90.88978 | 110.21815 | 134.21354 | 164.03699 | 201.13777 | 32 |
| 33 | 66.20953 | 80.06377 | 97.34316 | 118.93343 | 145.95062 | 179.80032 | 222.25154 | 33 |
| 34 | 69.85791 | 85.06697 | 104.18375 | 128.25876 | 158.62667 | 196.98234 | 245.47670 | 34 |
| 35 | 73.65222 | 90.32031 | 111.43478 | 138.23688 | 172.31680 | 215.71075 | 271.02437 | 35 |
| 36 | 77.59831 | 95.83632 | 119.12087 | 148.91346 | 187.10215 | 236.12472 | 299.12681 | 36 |
| 37 | 81.70225 | 101.62814 | 127.26812 | 160.33740 | 203.07032 | 258.37595 | 330.03949 | 37 |
| 38 | 85.97034 | 107.70955 | 135.90421 | 172.56102 | 220.31595 | 282.62978 | 364.04343 | 38 |
| 39 | 90.40915 | 114.09502 | 145.05846 | 185.64029 | 238.94122 | 309.06646 | 401.44778 | 39 |
| 40 | 95.02552 | 120.79977 | 154.76197 | 199.63511 | 259.05652 | 337.88245 | 442.59256 | 40 |
| 41 | 99.82654 | 127.83976 | 165.04768 | 214.60957 | 280.78104 | 369.29187 | 487.85181 | 41 |
| 42 | 104.81960 | 135.23175 | 175.95054 | 230.63224 | 304.24352 | 403.52813 | 537.63699 | 42 |
| 43 | 110.01238 | 142.99337 | 187.50758 | 247.77650 | 329.58301 | 440.84566 | 592.40069 | 43 |
| 44 | 115.41288 | 151.14301 | 199.75803 | 266.12085 | 356.94965 | 481.52177 | 652.64076 | 44 |
| 45 | 121.02939 | 159.70016 | 212.74351 | 285.74931 | 386.50562 | 525.85873 | 718.90484 | 45 |
| 46 | 126.87057 | 168.68516 | 226.50812 | 306.75176 | 418.42607 | 574.18602 | 791.79532 | 46 |
| 47 | 132.94539 | 178.11942 | 241.09861 | 329.22439 | 452.90015 | 626.86276 | 871.97485 | 47 |
| 48 | 139.26321 | 188.02539 | 256.56453 | 353.27009 | 490.13216 | 684.28041 | 960.17234 | 48 |
| 49 | 145.83373 | 198.42666 | 272.95840 | 378.99900 | 530.34274 | 746.86565 | 1057.18957 | 49 |
| 50 | 152.66708 | 209.34800 | 290.33590 | 406.52893 | 573.77016 | 815.08356 | 1163.90853 | 50 |
| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

# PRESENT VALUE OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{1-(1+i)^{-n}}{i}$$

| $n$ | $\frac{1}{2}\%$ | $1\%$ | $1\frac{1}{2}\%$ | $2\%$ | $2\frac{1}{2}\%$ | $3\%$ | $3\frac{1}{2}\%$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.99502 | 0.99010 | 0.98522 | 0.98039 | 0.97561 | 0.97087 | 0.96618 | 1 |
| 2 | 1.98510 | 1.97046 | 1.95588 | 1.94156 | 1.92742 | 1.91347 | 1.89969 | 2 |
| 3 | 2.97025 | 2.94099 | 2.91220 | 2.88388 | 2.85602 | 2.82861 | 2.80164 | 3 |
| 4 | 3.95050 | 3.90197 | 3.85438 | 3.80773 | 3.76197 | 3.71710 | 3.67308 | 4 |
| 5 | 4.92587 | 4.85343 | 4.78265 | 4.71346 | 4.64583 | 4.57971 | 4.51505 | 5 |
| 6 | 5.89638 | 5.79548 | 5.69719 | 5.60143 | 5.50813 | 5.41719 | 5.32855 | 6 |
| 7 | 6.86207 | 6.72819 | 6.59821 | 6.47199 | 6.34939 | 6.23028 | 6.11454 | 7 |
| 8 | 7.82296 | 7.65168 | 7.48593 | 7.32548 | 7.17014 | 7.01969 | 6.87396 | 8 |
| 9 | 8.77906 | 8.56602 | 8.36052 | 8.16224 | 7.97087 | 7.78611 | 7.60769 | 9 |
| 10 | 9.73041 | 9.47130 | 9.22218 | 8.98259 | 8.75206 | 8.53020 | 8.31661 | 10 |
| 11 | 10.67703 | 10.36763 | 10.07112 | 9.78685 | 9.51420 | 9.25266 | 9.00155 | 11 |
| 12 | 11.61893 | 11.25508 | 10.90751 | 10.57534 | 10.25776 | 9.95400 | 9.66333 | 12 |
| 13 | 12.55615 | 12.13374 | 11.73153 | 11.34837 | 10.98318 | 10.63496 | 10.30274 | 13 |
| 14 | 13.48871 | 13.00370 | 12.54338 | 12.10625 | 11.69091 | 11.29607 | 10.92052 | 14 |
| 15 | 14.41662 | 13.86505 | 13.34323 | 12.84926 | 12.38138 | 11.93794 | 11.51741 | 15 |
| 16 | 15.33993 | 14.71787 | 14.13126 | 13.57771 | 13.05500 | 12.56110 | 12.09412 | 16 |
| 17 | 16.25863 | 15.56225 | 14.90765 | 14.29187 | 13.71220 | 13.16612 | 12.65132 | 17 |
| 18 | 17.17277 | 16.39827 | 15.67256 | 14.99203 | 14.35336 | 13.75351 | 13.18968 | 18 |
| 19 | 18.08236 | 17.22601 | 16.42617 | 15.67846 | 14.97889 | 14.32380 | 13.70984 | 19 |
| 20 | 18.98742 | 18.04555 | 17.16864 | 16.35143 | 15.58916 | 14.87747 | 14.21240 | 20 |
| 21 | 19.88798 | 18.85698 | 17.90014 | 17.01121 | 16.18455 | 15.41502 | 14.69797 | 21 |
| 22 | 20.78406 | 19.66038 | 18.62082 | 17.65805 | 16.76541 | 15.93692 | 15.16712 | 22 |
| 23 | 21.67568 | 20.45582 | 19.33086 | 18.29220 | 17.33211 | 16.44361 | 15.62041 | 23 |
| 24 | 22.56287 | 21.24339 | 20.03041 | 18.91393 | 17.88499 | 16.93554 | 16.05837 | 24 |
| 25 | 23.44564 | 22.02316 | 20.71961 | 19.52346 | 18.42438 | 17.41315 | 16.48151 | 25 |
| 26 | 24.32402 | 22.79520 | 21.39863 | 20.12104 | 18.95061 | 17.87684 | 16.89035 | 26 |
| 27 | 25.19803 | 23.55961 | 22.06762 | 20.70690 | 19.46401 | 18.32703 | 17.28536 | 27 |
| 28 | 26.06769 | 24.31644 | 22.72672 | 21.28127 | 19.96489 | 18.76411 | 17.66702 | 28 |
| 29 | 26.93302 | 25.06579 | 23.37608 | 21.84438 | 20.45350 | 19.18845 | 18.03577 | 29 |
| 30 | 27.79405 | 25.80771 | 24.01584 | 22.39646 | 20.93023 | 19.60044 | 18.39205 | 30 |
| 31 | 28.65080 | 26.54229 | 24.64615 | 22.93770 | 21.39540 | 20.00043 | 18.73628 | 31 |
| 32 | 29.50328 | 27.26959 | 25.26714 | 23.46834 | 21.84918 | 20.38877 | 19.06887 | 32 |
| 33 | 30.35153 | 27.98969 | 25.87895 | 23.98856 | 22.29181 | 20.76579 | 19.39021 | 33 |
| 34 | 31.19555 | 28.70267 | 26.48173 | 24.49859 | 22.72379 | 21.13184 | 19.70068 | 34 |
| 35 | 32.03537 | 29.40858 | 27.07559 | 24.99862 | 23.14516 | 21.48722 | 20.00066 | 35 |
| 36 | 32.87102 | 30.10751 | 27.66068 | 25.48884 | 23.55625 | 21.83225 | 20.29049 | 36 |
| 37 | 33.70250 | 30.79951 | 28.23713 | 25.96945 | 23.95732 | 22.16724 | 20.57053 | 37 |
| 38 | 34.52985 | 31.48466 | 28.80505 | 26.44064 | 24.34860 | 22.49246 | 20.84109 | 38 |
| 39 | 35.35309 | 32.16303 | 29.36458 | 26.90259 | 24.73034 | 22.80822 | 21.10250 | 39 |
| 40 | 36.17223 | 32.83469 | 29.91585 | 27.35548 | 25.10278 | 23.11477 | 21.35507 | 40 |
| 41 | 36.98729 | 33.49969 | 30.45896 | 27.79949 | 25.46612 | 23.41240 | 21.59910 | 41 |
| 42 | 37.79800 | 34.15811 | 30.99405 | 28.23479 | 25.82061 | 23.70136 | 21.83488 | 42 |
| 43 | 38.60527 | 34.81001 | 31.52123 | 28.66156 | 26.16645 | 23.98190 | 22.06269 | 43 |
| 44 | 39.40823 | 35.45545 | 32.04062 | 29.07996 | 26.50385 | 24.25427 | 22.28279 | 44 |
| 45 | 40.20720 | 36.09451 | 32.55234 | 29.49016 | 26.83302 | 24.51871 | 22.49545 | 45 |
| 46 | 41.00219 | 36.72724 | 33.05649 | 29.89231 | 27.15417 | 24.77545 | 22.70092 | 46 |
| 47 | 41.79322 | 37.35370 | 33.55319 | 30.28658 | 27.46748 | 25.02471 | 22.89944 | 47 |
| 48 | 42.58032 | 37.97396 | 34.04255 | 30.67312 | 27.77315 | 25.26671 | 23.09124 | 48 |
| 49 | 43.36350 | 38.58808 | 34.52468 | 31.05208 | 28.07137 | 25.50166 | 23.27656 | 49 |
| 50 | 44.14279 | 39.19612 | 34.99969 | 31.42361 | 28.36231 | 25.72976 | 23.45562 | 50 |
| $n$ | $\frac{1}{2}\%$ | $1\%$ | $1\frac{1}{2}\%$ | $2\%$ | $2\frac{1}{2}\%$ | $3\%$ | $3\frac{1}{2}\%$ | $n$ |

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

# PRESENT VALUE OF AN ANNUITY

$$s_{\overline{n}|i} = \frac{1-(1+i)^{-n}}{i}$$

| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.96154 | 0.95238 | 0.94340 | 0.93458 | 0.92593 | 0.91743 | 0.90909 | 1 |
| 2 | 1.88609 | 1.85941 | 1.83339 | 1.80802 | 1.78326 | 1.75911 | 1.73554 | 2 |
| 3 | 2.77509 | 2.72325 | 2.67301 | 2.62432 | 2.57710 | 2.53129 | 2.48685 | 3 |
| 4 | 3.62990 | 3.54595 | 3.46511 | 3.38721 | 3.31213 | 3.23972 | 3.16987 | 4 |
| 5 | 4.45182 | 4.32948 | 4.21236 | 4.10020 | 3.99271 | 3.88965 | 3.79079 | 5 |
| 6 | 5.24214 | 5.07569 | 4.91732 | 4.76654 | 4.62288 | 4.48592 | 4.35526 | 6 |
| 7 | 6.00205 | 5.78637 | 5.58238 | 5.38929 | 5.20637 | 5.03295 | 4.86842 | 7 |
| 8 | 6.73274 | 6.46321 | 6.20979 | 5.97130 | 5.74664 | 5.53482 | 5.33493 | 8 |
| 9 | 7.43533 | 7.10782 | 6.80169 | 6.51523 | 6.24689 | 5.99525 | 5.75902 | 9 |
| 10 | 8.11090 | 7.72173 | 7.36009 | 7.02358 | 6.71008 | 6.41766 | 6.14457 | 10 |
| 11 | 8.76048 | 8.30641 | 7.88687 | 7.49867 | 7.13896 | 6.80519 | 6.49506 | 11 |
| 12 | 9.38507 | 8.86325 | 8.38384 | 7.94269 | 7.53608 | 7.16073 | 6.81369 | 12 |
| 13 | 9.98565 | 9.39357 | 8.85268 | 8.35765 | 7.90378 | 7.48690 | 7.10336 | 13 |
| 14 | 10.56312 | 9.89864 | 9.29498 | 8.74547 | 8.24424 | 7.78615 | 7.36669 | 14 |
| 15 | 11.11839 | 10.37966 | 9.71225 | 9.10791 | 8.55948 | 8.06069 | 7.60608 | 15 |
| 16 | 11.65230 | 10.83777 | 10.10590 | 9.44665 | 8.85137 | 8.31256 | 7.82371 | 16 |
| 17 | 12.16567 | 11.27407 | 10.47726 | 9.76322 | 9.12164 | 8.54363 | 8.02155 | 17 |
| 18 | 12.65930 | 11.68959 | 10.82760 | 10.05909 | 9.37189 | 8.75563 | 8.20141 | 18 |
| 19 | 13.13394 | 12.08532 | 11.15812 | 10.33560 | 9.60360 | 8.95011 | 8.36492 | 19 |
| 20 | 13.59033 | 12.46221 | 11.46992 | 10.59401 | 9.81815 | 9.12855 | 8.51356 | 20 |
| 21 | 14.02916 | 12.82115 | 11.76408 | 10.83553 | 10.01680 | 9.29224 | 8.64869 | 21 |
| 22 | 14.45112 | 13.16300 | 12.04158 | 11.06124 | 10.20074 | 9.44243 | 8.77154 | 22 |
| 23 | 14.85684 | 13.48857 | 12.30338 | 11.27219 | 10.37106 | 9.58021 | 8.88322 | 23 |
| 24 | 15.24696 | 13.79864 | 12.55036 | 11.46933 | 10.52876 | 9.70661 | 8.98474 | 24 |
| 25 | 15.62208 | 14.09394 | 12.78336 | 11.65358 | 10.67478 | 9.82258 | 9.07704 | 25 |
| 26 | 15.98277 | 14.37519 | 13.00317 | 11.82578 | 10.80998 | 9.92897 | 9.16095 | 26 |
| 27 | 16.32959 | 14.64303 | 13.21053 | 11.98671 | 10.93516 | 10.02658 | 9.23722 | 27 |
| 28 | 16.66306 | 14.89813 | 13.40616 | 12.13711 | 11.05108 | 10.11613 | 9.30657 | 28 |
| 29 | 16.98371 | 15.14107 | 13.59072 | 12.27767 | 11.15841 | 10.19828 | 9.36961 | 29 |
| 30 | 17.29203 | 15.37245 | 13.76483 | 12.40904 | 11.25778 | 10.27365 | 9.42691 | 30 |
| 31 | 17.58849 | 15.59281 | 13.92909 | 12.53181 | 11.34980 | 10.34280 | 9.47901 | 31 |
| 32 | 17.87355 | 15.80268 | 14.08404 | 12.64656 | 11.43500 | 10.40624 | 9.52638 | 32 |
| 33 | 18.14765 | 16.00255 | 14.23023 | 12.75379 | 11.51389 | 10.46444 | 9.56943 | 33 |
| 34 | 18.41120 | 16.19290 | 14.36814 | 12.85401 | 11.58693 | 10.51784 | 9.60857 | 34 |
| 35 | 18.66461 | 16.37419 | 14.49825 | 12.94767 | 11.65457 | 10.56682 | 9.64416 | 35 |
| 36 | 18.90828 | 16.54685 | 14.62099 | 13.03521 | 11.71719 | 10.61176 | 9.67651 | 36 |
| 37 | 19.14258 | 16.71129 | 14.73678 | 13.11702 | 11.77518 | 10.65299 | 9.70592 | 37 |
| 38 | 19.36786 | 16.86789 | 14.84602 | 13.19347 | 11.82887 | 10.69082 | 9.73265 | 38 |
| 39 | 19.58448 | 17.01704 | 14.94907 | 13.26493 | 11.87858 | 10.72552 | 9.75696 | 39 |
| 40 | 19.79277 | 17.15909 | 15.04630 | 13.33171 | 11.92461 | 10.75736 | 9.77905 | 40 |
| 41 | 19.99305 | 17.29437 | 15.13802 | 13.39412 | 11.96723 | 10.78657 | 9.79914 | 41 |
| 42 | 20.18563 | 17.42321 | 15.22454 | 13.45245 | 12.00670 | 10.81337 | 9.81740 | 42 |
| 43 | 20.37079 | 17.54591 | 15.30617 | 13.50696 | 12.04324 | 10.83795 | 9.83400 | 43 |
| 44 | 20.54884 | 17.66277 | 15.38318 | 13.55791 | 12.07707 | 10.86051 | 9.84909 | 44 |
| 45 | 20.72004 | 17.77407 | 15.45583 | 13.60552 | 12.10840 | 10.88120 | 9.86281 | 45 |
| 46 | 20.88465 | 17.88007 | 15.52437 | 13.65002 | 12.13741 | 10.90018 | 9.87528 | 46 |
| 47 | 21.04294 | 17.98102 | 15.58903 | 13.69161 | 12.16427 | 10.91760 | 9.88662 | 47 |
| 48 | 21.19513 | 18.07716 | 15.65003 | 13.73047 | 12.18914 | 10.93358 | 9.89693 | 48 |
| 49 | 21.34147 | 18.16872 | 15.70757 | 13.76680 | 12.21216 | 10.94823 | 9.90630 | 49 |
| 50 | 21.48218 | 18.25593 | 15.76186 | 13.80075 | 12.23348 | 10.96168 | 9.91481 | 50 |
| $n$ | 4% | 5% | 6% | 7% | 8% | 9% | 10% | $n$ |

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

## Teacher Questionnaire

Course name & number _____ Teacher's name _____

Teacher's area of expertise _____ School name _____

Date _____

### Design

1. The unit follows a definite systematic design. Did you find it easy to follow?

   Yes No If no, explain.

   _____

   _____

2. Did your observations reveal that the students found the design easy to follow?

   Yes No If no, explain.

   _____

   _____

3. Did you find the Learning Facilitator's Manual helpful?

   Yes No If no, explain.

   _____

   _____

4. Part of the design involves stating the objectives in student terms. Do you feel this helped the students understand what they were going to learn?

   Yes No If no, explain.

   _____

   _____

5. The activities include self-assessment questions. These questions are to help clarify and reinforce the instructional materials. Did students use the answers effectively?

Yes No If no, explain.

_____

_____

6. Did the Extra Help and Extensions sections prove to be helpful?

Yes No If no, explain.

_____

_____

7. Were students motivated to try these two sections on their own?

Yes No If no, give details.

_____

_____

8. Were the assignments clear?

Yes No If no, give details.

_____

_____

9. Were the assignments appropriate?

Yes No If no, give details.

_____

_____

10. Did you fax assignments?

Yes No

11. If you did fax, did you get satisfactory results from using this procedure?

Yes No If no, give details.

_____

_____

_____

## Instruction

1. Did you find the instruction clear?

Yes No If no, give details.

_____

_____

2. Did your observations reveal that the students found the instruction interesting?

Yes No If no, give details.

_____

_____

3. Did you find the instruction adequate?

Yes No If no, give details.

_____

_____

4. Was the reading level appropriate?

Yes No If no, give details.

5. Was the work load adequate?

Yes No If no, give details.

6. Was the content accurate and current?

Yes No If no, give details.

7. Did the content flow consistently and logically?

Yes No If no, give details.

8. Was the transition between booklets smooth?

Yes No If no, give details.

9. Was the transition between print and media smooth?

Yes No If no, give details.

## Additional Comments

When you have completed this questionnaire, please mail it to the following address.

Design Department
Alberta Correspondence School
Box 4000
Barrhead, Alberta
T0G 2P0

N.L.C. - B.N.C.
3 3286 10844511 1